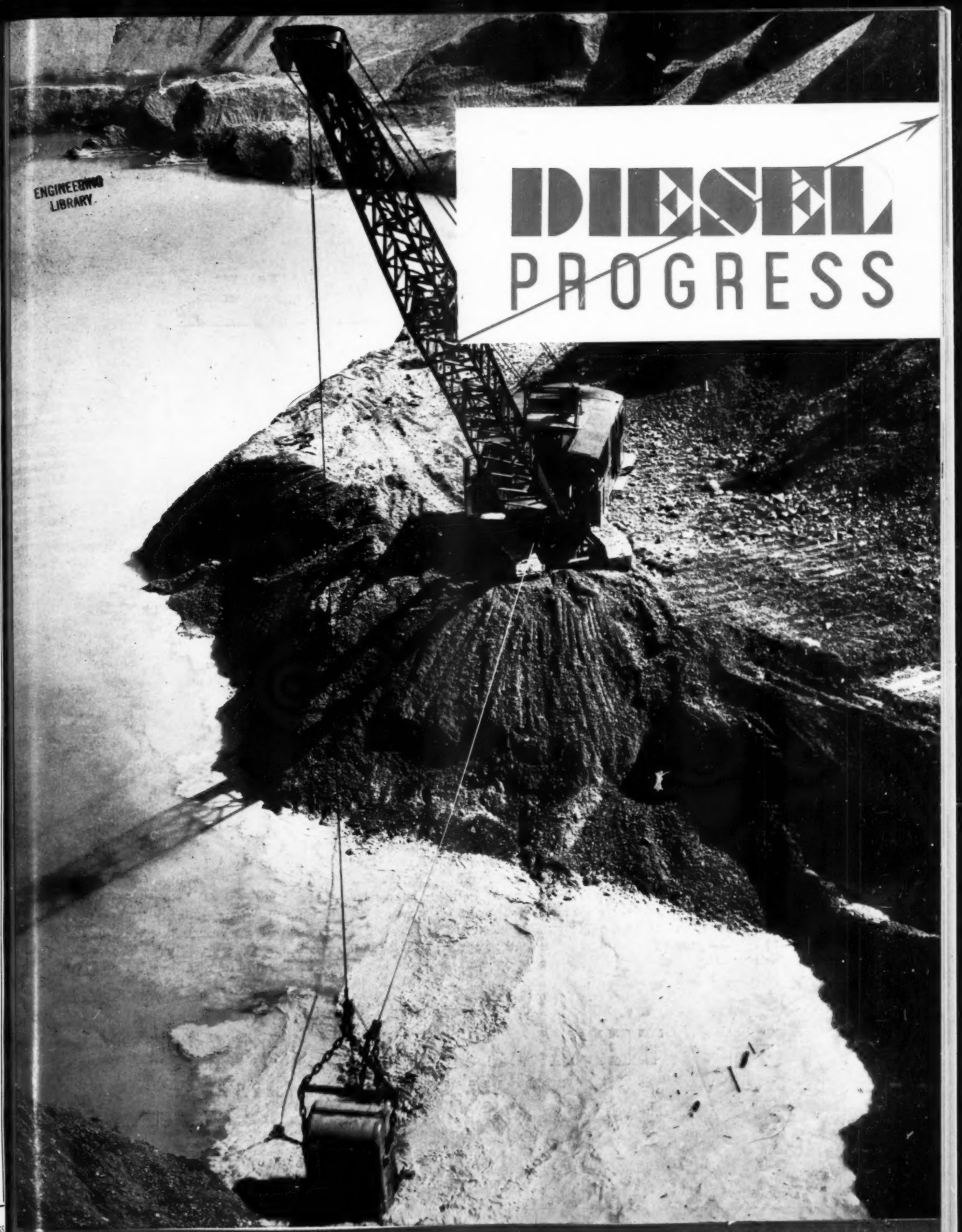

DIESEL PROGRESS

FIVE DOLLARS PER YEAR JULY, 1948 FIFTY CENTS PER COPY

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DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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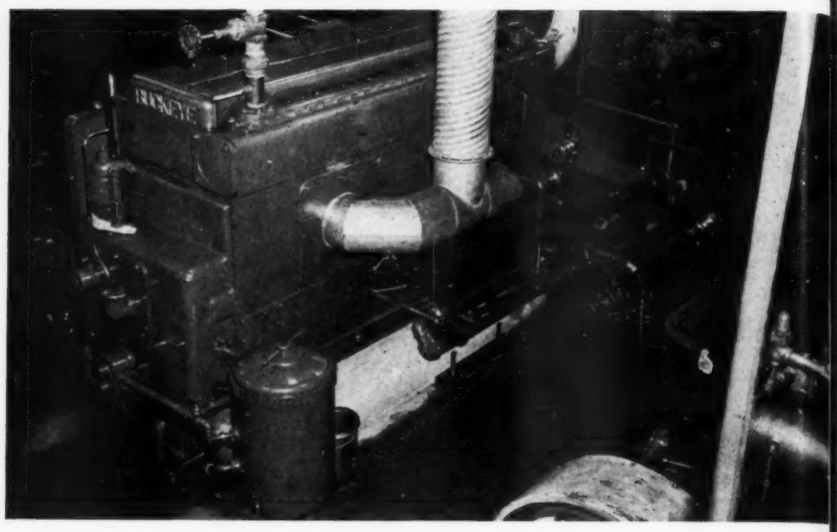
JULY 1948

COVER ILLUSTRATION: Two-yard dragline excavator powered by a Caterpillar diesel handles 1000 tons of aggregate per 8 hr. day for Pacific Coast Aggregates, Pleaston, California.

DIESEL PROGRESS for July, 1948, Vol. XIV, No. 7. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York 19, N. Y. Tel. MUrray-Hill 2-733. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £1-17s per year.

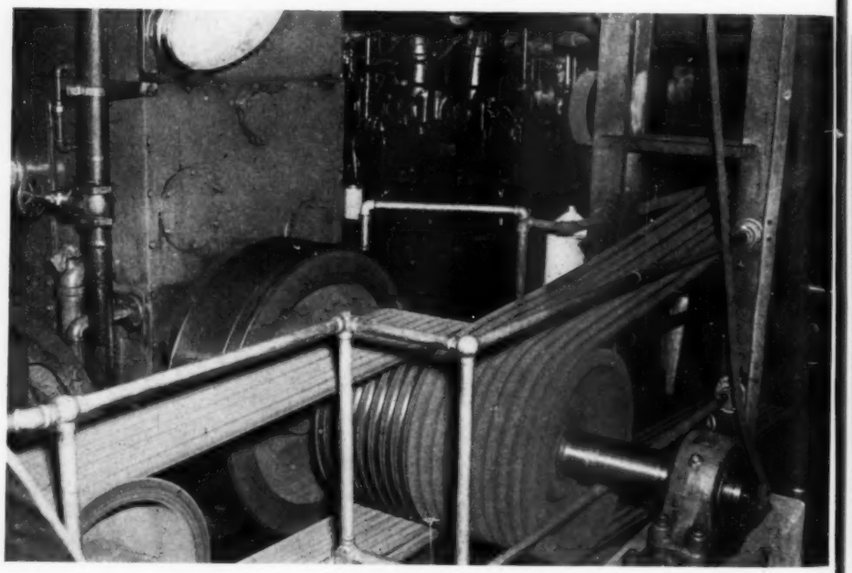
BALTIMORE COLD STORAGE PLANT

By JOHN W. ORRSON



New Buckeye diesel at cold storage plant develops 350 hp. driving 100 kw. Westinghouse generator and Frick compressor.

Chief engineer Willis designed this dual V-belt drive off the tailshaft of Buckeye diesel. Both the generator and compressor take power from diesel.



THE use of industrial stationary diesels in the Middle Atlantic states, particularly in the Baltimore area, has not reached the same heights in popularity as in the other sections of the country. But all sources of contact indicate that conversion to this method of operation is on the upgrade. Why this lag is so prominent in the stationary field in this section, it is difficult to determine. It may be that potential users have not been sufficiently sold on this money-saving investment, or the low commercial electrical rates, offered by local utility companies, may have dampened the curiosity of the diesel aspirant.

However, there is no doubt that the use of diesel in this locale is on the increase after observing the overall picture, taking into consideration the rapid strides made by the marine and construction fields. On the Baltimore waterfront, marine installations have a good lead over the other phases of diesel application.

Cost-conscious operators of tugboats, barges, tankers and other allied work crafts are definitely but slowly replacing their former power units with small or large diesels, depending on the size and kind of vessel. The return to the other types of propulsion is strictly limited, according to all reports. Conversion to stationary diesel installations among Baltimore's vast industries has traveled a gradual pace. Although limited in number, these diesel units furnish power and electricity, dependably and economically, to a list of diversified industries, ranging from refrigeration plants to cotton mills.

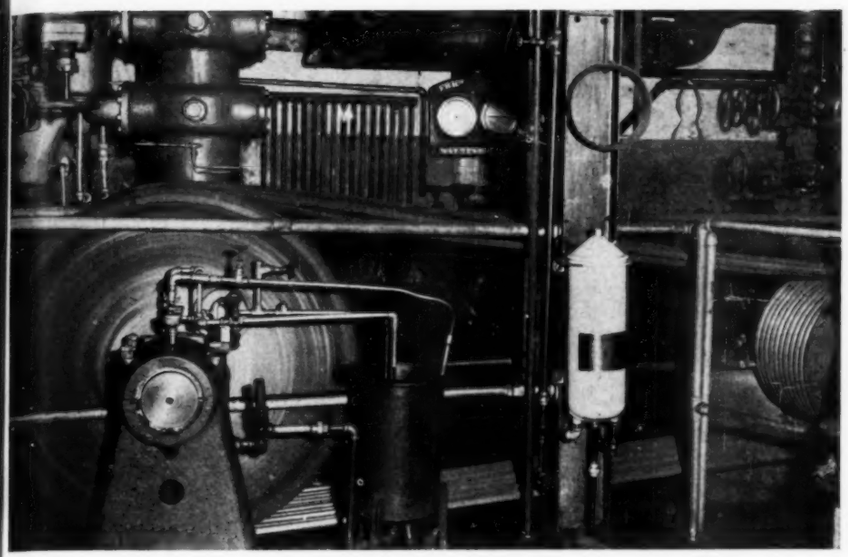
Among the first in the city to dieselize its operations was the Baltimore Cold Storage Company in the downtown section of city. Established 33 years ago by J. C. Leib, who still heads the firm, four Baldwin De La Vergne twin cylinder, horizontal type diesels, 120 hp. each, drove generators and compressors for the refrigeration plant when it opened its doors. A leader then in the diesel field, this Baltimore firm still maintains such a progressive reputation. Its modern engine room, containing a battery of four diesel units, is considered to be the most up-to-date and efficient source of energy in the whole state of Maryland.

This achievement was earned, according to E. C. Willis, the plant's able Chief Engineer who was with the firm when the first engine was started, by keeping abreast with the times and a constant surveillance over the operating equipment.

The cold storage plant offered diesel a chance to prove its offer of low cost operation and continuous service. It also pointed out that any lengthy period of power failure would spell ruin for tons of perishable foodstuffs of meat packers, produce men, and sea food dealers. Diesels were called upon to furnish electricity and power for ammonia compressors to keep 303,000 cubic feet of freezer space at temperatures ranging from zero to 15 degrees below. In addition, its duty was to refrigerate 225,000 cubic feet of space in holding rooms, maintaining 32 to 40 degrees in temperature, plus a 40-ton ice tank which produced ice for commercial purposes.

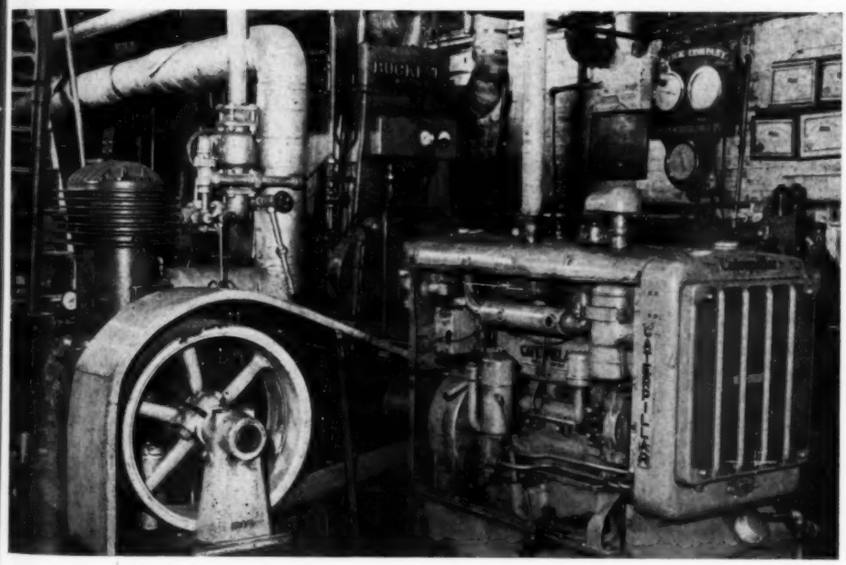
As in all refrigerator plants without auxiliary lines leading in from utility company for emergency purposes, power and compressors must be maintained at all times. Furnishing this constant energy under these conditions in the Baltimore plant are three Buckeyes, one Fairbanks-Morse, and one Caterpillar diesel. The Number 1 and 2 engines on this formidable bank of power are identical Buckeye engines with a 9½ in. bore and 14 in. stroke, providing its maximum 187 hp. at 400 rpm. The Number 1 unit which like its sister engine has five cylinders, drives simultaneously by an unusual V belt pulley arrangement a 10 x 10 York compressor at 197 rpm., and a 75 kw. Westinghouse generator at the higher rate of speed of 800 rpm. without any standard reduction gears.

The only job relegated to the number 2 unit is to spin a 12 x 15 DeLavergne compressor at 240



View of Frick compressor with mechanically lubricated outboard bearing. Briggs fuel oil filter is seen mounted on post.

Caterpillar diesel drives booster compressor Buckeye diesel seen in background.



rpm. Both engines employ Briggs fuel and lube oil filtration. Newest in the line is the number 3 engine which was installed in February of 1947. It is the Model 80 of Buckeye, six cylinder, four cycle, and develops 350 hp. at 600 rpm. Bore of this engine is 10½ in. and its stroke is 12 in. The dual V belt drive system, designed by Mr. Willis is also used on the tailshaft as it turns a 100 kw. Westinghouse generator at 650 rpm., and a 12 x 12 Frick compressor at the slower speed of 275 rpm. Fuel and lube oil filters, mounted on this model, are Briggs.

Installed in 1943 was the number 4 engine, a 200 horsepower Fairbanks-Morse. With its 10 in. bore and 14 in. stroke, it reaches its top horsepower rating at 400 rpm. and its sole purpose is to drive a 12 x 14 DeLavergne compressor at 240 rpm. Smallest on the diesel team and added in March, 1946 is the four cylinder, four cycle Caterpillar, which at its top speed of 1600 rpm., provides its 34 horsepower. The number 4 is coupled to an 8½ x 6 Frick compressor, turning 450 rpm., and acts as a booster.

The job of keeping this equipment in top condition in order to furnish approximately 284 tons of constant refrigeration is under the supervision of Mr. Willis and his day and night staff of seven men. Mr. Willis, born and raised in the Tidewater section of Gloucester, Va., is a veteran diesel man and tested his first morsel of its power when he was a member of a crew, aboard fishing trawlers, operating off the Maryland and Virginia Coast.

His vast experience in the engine room enabled the Chief Engineer to add a number of innovations in his own plant. Amog these are the space-saving dual V belt drives, a mechanical lubricator for the outboard bearing on the Frick compressor, water cooled exhaust stack for the Fairbanks-Morse, air intake lines, and a general water re-circulation hook-up for four of the larger diesels.

One of his most practical additions is the water cooling system. Water is re-circulated from the engines to a forced draft cooling tower on the roof of the building by a 300 gallon per minute Ingersoll-Rand centrifugal pump. This splendid method of cooling enables the engineers to maintain water temperatures of 130 degrees at the outlet and 110 to 120 degrees at the inlet. As a replacement to the conventional oil chain procedure of lubricating the outboard bearing on the Frick compressor, Mr. Willis devised his own ingenious re-circulating system which passes SAE #30 mineral oil in a steady stream on the bearing surface. Pressure in the system originates from a ¼ in. water pump and keeps five gallons of lube oil in continuous circulation. Oil is changed but once a year.

Fuel is carefully watched so that it does not pick up any foreign particles. The main storage tank with a 10,000 gallon capacity, is sunk below the surface of the ground under a driveway. The fuel oil which is #208 diesel of Standard Esso passes through a Skinner fuel oil filter and receives another filtration by the fullers earth compound of the Briggs filter before it reaches the engines. The fuel oil day tank in the engine room holds 200 gallons.

Mr. Willis, an adherent of the detergent type of lubricating oil, cannot be shaken from his convictions and uses Standard Esso's #30HD for all the diesels with the exception of the new Buckeye. On this unit, following the manufacturer's recommendation, the lube oil is #40HD grade.

"Proper lubrication," informed Mr. Willis, "and efficient maintenance of the equipment is the life of the diesel engine. During the summer months when temperatures are high, all of our engine room equipment is put to task, sometimes running six months without any period of rest. So under these conditions we make it a point to give our engines, generators, and compressors the best possible care and see that they are functioning properly. And it has paid off. We haven't had any serious trouble. In the winter time, it gives us a chance to work on our equipment as we operate the number 1 and number 3 engines, alternately.

"We watch our lube oil closely. We try to maintain our oil temperatures at 140 degrees to get the benefits of its full lubricating qualities. After a period of 1,000 hours, samples of the oil are sent to the Standard company for inspection.

"Lube oil filters are carefully watched and the cartridges are replaced immediately when needed. The life of the Briggs paper element on the older engines have been about three months while on the new Buckeye, we have had one change in a year's time. Once a year, we tear down each engine for a general overhaul. Worn parts are replaced before the engines are re-assembled. Every three months, each engine draws an inspection date and each port is opened for the examination of the bearings and the alignment of the crankshaft. For engine performance, I daresay that I am more then satisfied with the services which the Buckeye diesels have given us."

DIESELS LEAD WAY TO EA

Development of Hydraulic Controls For Diesel Equipment Discussed at California Joint Conference. Standardized Hydraulic Equipment Proposed For California's 35,000 Crawler Tractors.

International Diesel wheel tractor hauls Miller Rotary Scraper. Hydraulic controls mounted on scraper and operated by driver make things easy.

THE Diesel engine has brought many economies into farm, logging, oil field, heavy construction, transportation and marine fields. Usually, these savings have been figured in dollars and cents savings in fuel. The Joint Conference of the University of California Farm Machinery and the Farm Equipment Institute conference at the University of California agricultural college campus at Davis, however, brought out into sharp focus another savings that is very much in the minds and research departments of the farm tractor and machinery industry. It is hydraulic control of the tools pulled, pushed and lifted by the tractors. John Brundage, Chief Engineer, Allis-Chalmers Mfg. Co., Oxnard, estimates 20% of the crawler tractors in California are so equipped.

War brought to the West Coast hydraulic control demands on farm, dirt moving and other tools hooked to tractors until every owner and operator demanded them. The comparatively little earth moving scraper firm of Be-Ge at Gilroy, Calif., was the main spring in developing this hydraulic control for Caterpillar, International, Allis-Chalmers and Oliver-Cletrac tractors. These are practically all Diesel powered on the Coast, the first two firms making their own Diesel engines and the latter two lines being powered by GM and Hercules Diesels.

It was natural for such full-line farm implement manufacturers as Deere, Allis-Chalmers, International and Caterpillar with factories in California to take cognizance of the farmer as well as contractor demand for hydraulic controls to lift, lower and angle tools hitched to their tractors. In the case of the first three firms, they built the tools that were sold with their tractors, so why not build hydraulic controls to best serve the owners and operators rather than allow some outside firm to build and sell an item that might not be specially designed for tractor and tool? Hence, in the Killefer plant of John Deere Plow Co. at Los Angeles, in the Allis-Chalmers Brenneis plant at Oxnard, and in the International plant at Stockton, engineers have been designing and developing hydraulic controls to go with each size tractor to be worked on the many tools built by these firms to be powered by their tractors.

Over at Chicago, the national association—Farm Equipment Institute—had noted that what was going on the West Coast was so good that the idea was seeping through the mountains and getting into the demands of farmers in Mid-West and South. Of course, the contractors building roads, airports and such dirt-moving jobs were using them and the dealers selling to such contractors were also selling to farmers in some areas. So, it became an industrial question of standardization for better service to the consumer of tractors and farm implements. A Research Committee was set up by the Farm Equipment Institute to work out standards to permit one make of hydraulic controls to be used by a farmer on any make of tool.

To help the national committee with facts right out of the fire of experience where thousands of these controls have been used over the past eight years a West Coast sub-committee was appointed. The last two years had added a lot of competitive experience from the tractor builders who were starting to huild, sell and service their own makes of hydraulic controls. At this 3-day joint conference at the University's Agricultural Engineering building, there were shown hydraulic controls on tractors by Deere & Co., Allis-Chalmers Mfg. Co., International Harvester Co., and Caterpillar Tractor Co. In addition to honoring these firms with a floor show in the University's Agricultural Engineering building, each company had its special hydraulic Control engineer on the program that Prof. Roy Bainer pronounced the high point in the conference.

The top honor spot on this final half-day session given to Hydraulic Controls was filled by John F. Brundage, Chief Engineer, Allis-Chalmers Mfg. Co., Oxnard, Calif. Discussion was by Deere's C. T. Rassmussen, International's L. H. Kaupke, and Caterpillar's Warren Brown. E. W. Tanquary, chairman of the Farm Equipment Institute Advisory Engineering Committee, gave the summary following the other four engineers. Following the session on hydraulic controls, an inspection of the equipment by the crowd gave everybody an opportunity to study the different controls, their locations and connections. So universal was the interest in this post-war sweep of an idea that the paper with diagrams by Brundage is worthy of study here. The standardization aimed at hasn't been achieved yet, but is expected to be worked out within a short time by the committee. In the meantime, the meeting has given such impetus to the idea that it is expected to be adopted very rapidly in the larger farming areas where the trend is for owners and their families to operate the tractors for higher efficiency.

"Hydraulic controls for farm implements consist of the hydaulic power control unit, the control cylinder, and the hose lines connecting the control unit to the cylinder," said Brundage.

"The power control unit includes the pump, the control valve, and the fluid supply tank. Generally these three items are assembled into one complete package. In most agricultural installations the pump is mounted on the rear face of the transmission case and driven by the tractor power-take-off shaft. Flexible hydraulic hose lines connect the pump to the remote control cylinder.

"This paper deals primarily with the problems

EASIER TRACTOR WORK

By F. HAL HIGGINS

International Harvester Co.'s representatives at the California Joint Conference. Left to right, J. R. Orelind, Ass't Mgr. Implement Engineering; Gen. L. N. Campbell, Vice President; A. E. W. Johnson, Director of Engineering and Patents; L. H. Ford, Consumer Relations; S. D. Pool, Engineering Research.

(Above) Hydraulic Control Engineers pictured at the Conference. Left to right, E. W. Tanquary, International Harvester, chairman of the research committee; C. T. Rasmussen, John Deere, Killefer Factory; J. F. Brundage, Allis-Chalmers Mfg. Co., chief speaker; Warren Brown, Caterpillar Tractor Co.

(Left) Caterpillar engineers for Peoria and San Leandro at conference. Top row, left to right — Frank Hanson, Chairman, Research Committee, Farm Equipment Institute and Assistant Manager of Merchandise Dept.; Gordon Fowler, Frank Stafford, District Representatives; Ben Halund, Western Sales Manager; Alex Justason, Assistant Manager; Carl Reen, Field Engineer; bottom row left to right, G. E. Burks, Chief Engineer; Warren G. Brown, Research Engineering staff; J. H. Fort, Special Representative; C. R. Johnson, District Representative. Roy E. Mayo, Research Supervisor.

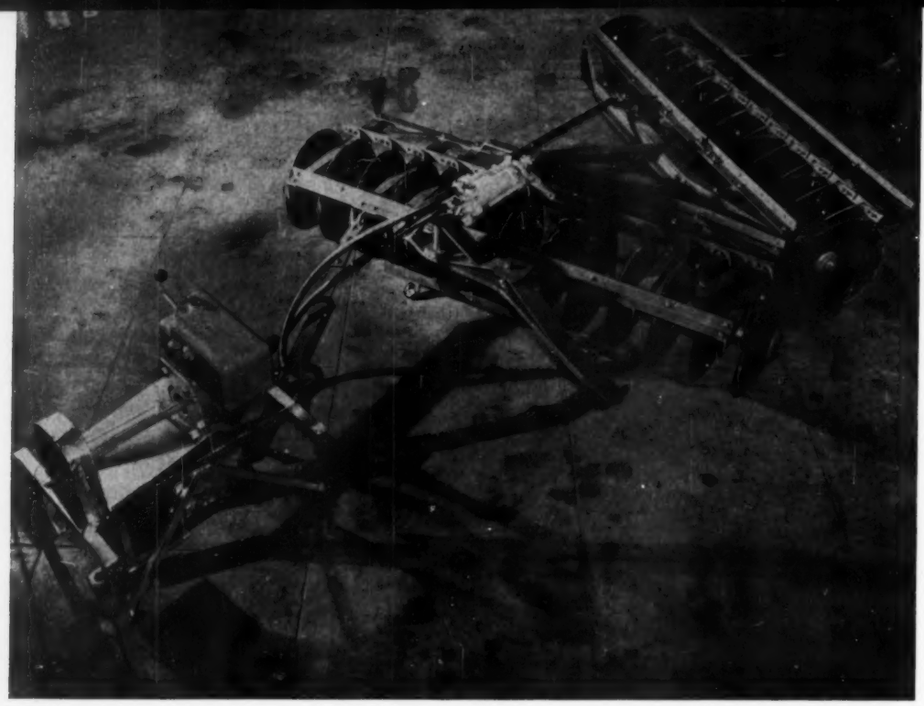
involved in the development and design of a line of hydraulic control cylinders, and the mounting of these cylinders on drawn implements of the deep tillage type. These implements most generally are pulled with crawler tractors of 30 horsepower or greater.

"History—Present Status: It is interesting to note that the first practical applications of hydraulic controls to drawn implements were made here on the West Coast. Approximately twenty years ago, this method of control was applied to heavy dirt moving equipment. The success of hydraulic controls demonstrated on this type of equipment led to the development of smaller, more economically priced power control units suitable for use with agricultural implements. Within the next ten years, different makes of pump and valve units, along with control cylinders were developed for use with land levelers. These levelers being strictly an agricultural implement used to prepare and maintain land in a condition suitable for efficient irirgation practices. With the hydraulic power control unit available on their tractors, many owners made up their own hydraulic control installations for other implements. These installations, even though sometimes quite crude, improved the performance and operation of the implement.

"The growth in the use and popularity of hydraulic controls on farm equipment is illustrated graphically by the curves on Chart No. 1. The lower curve on this chart shows the approximate number of hydraulic power control units which were sold each year beginning with 1940, these units being those sold for installation on agricultural crawler tractors in California. This curve is based on sales estimates furnished by Be-Ge Manufacturing Company, Kay Brunner Steel Products, Inc., Atlas Scraper and Engineering Company and Jumbo Steel Products Company. The upper curve indicates the accumulated total number of units now in field use neglecting replacements sales. The best estimates available indicate a crawler tractor population for the State of California of around 35,000. Assuming a pump life of five years, approximately 15-20 per cent of the crawler tractors in California are now equipped with hydraulic power control units. This compares with approximately one per cent so equipped in 1940.

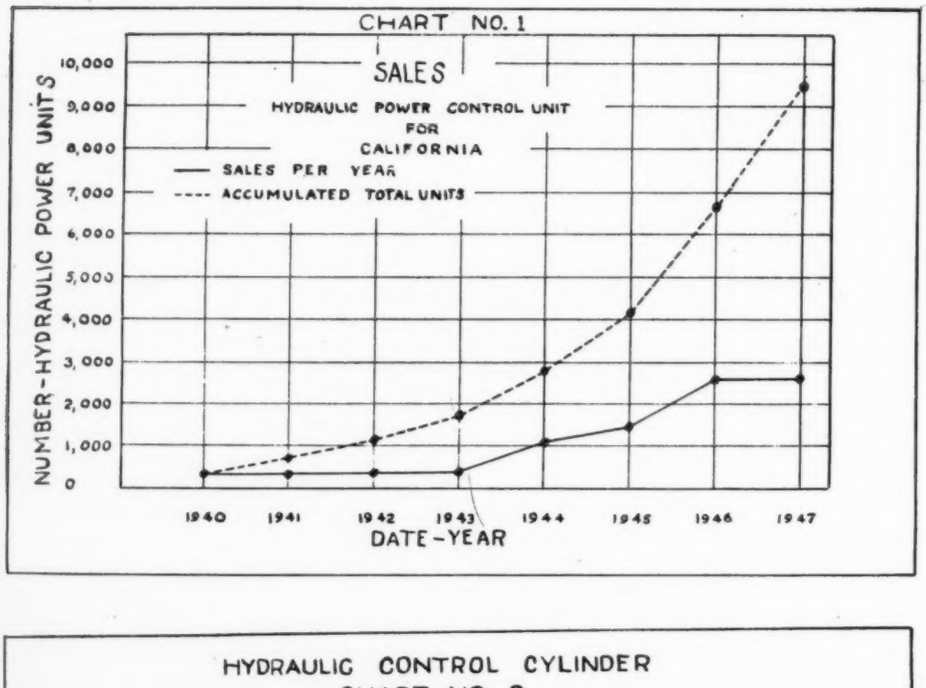
"Purpose—Advantages of Hydraulic Controls: The very rapid growth in the use of hydraulic control equipment for farm implements is ample evidence of the advantages obtained with this type of control. Positive control of the working angle or depth of tillage implements, independent of the tractor movement or soil reaction on the implement, is possible with hydraulic controls. A good machine should, from the framer's or farm management standpoint, save time and man labor, it should reduce the physical exertions of farming, improve the quality of farm products, embody maximum safety features, and be of a design and appearance which stimulates the pride of ownership. Each of these requirements or features have been greatly improved through the development and use of hydraulic controls on farm implements.

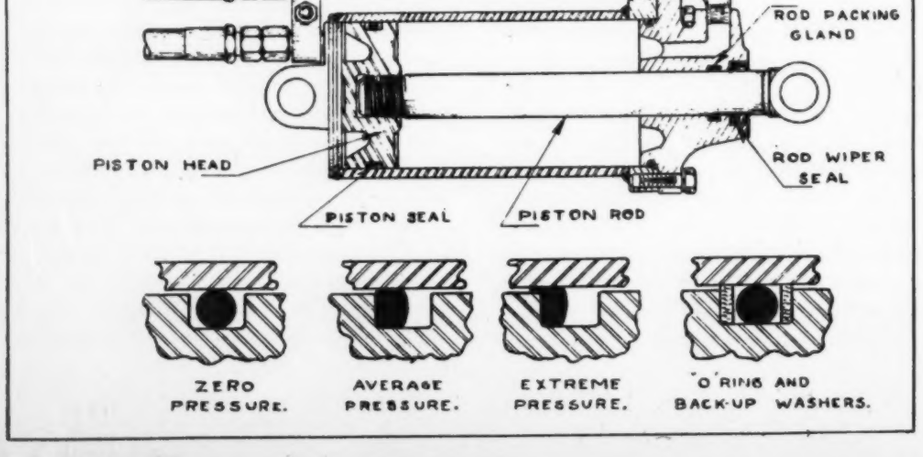
"Design Problems—Capacity Requirements: In the development of hydraulic controls for farm implements the first problem to be solved is the determination of the capacity, bore and stroke of the control cylinder. This control cylinder must perform the desired work of actuating a given implement from maximum working depth or angle position to fully raised or closed position. Our desire was to develop a line of control cylinders of the fewest possible sizes to adequately handle heavy duty deep tillage implements used in conjunction with crawler tractors. The crawler tractor models most commonly found in agricultural use can be divided into three groups of approximately equal horsepower ratings: small tractors—25-30 hp.; medium tractors—35-45 hp.; and large tractors 55 hp. and over. From this consideration, it seemed desirable to develop a line of three control cylinders with the approximate capacities to handle equipment drawn by tractors of each of the three size groups. Field tests were made to determine the actual control cylinder capacity requirements for each given range of implement sizes. Maximum working pressures at the pump were desired, ranging from 600-800 lb./in.^{2} These tests resulted in selection of the following control cylinder sizes: implements for small tractors—5 in. dia. x 8 in. stroke; medium range—5 in. dia. x 12 in. stroke; and implements for tractors over 55 hp.—5 in. dia. x 16 in. stroke. In actual use, the higher operating pressure range is required to increase the capacity



Caterpillar Hydraulic Implement Control and Hydraulic Jack operating a Kellifer disc-harrow. One out of five Caterpillar Diesels in California are equipped with hydraulic controls.

Charts 1 and 2 below show sales of hydraulic power units in California and details of Caterpillar, hydraulic control cylinder.





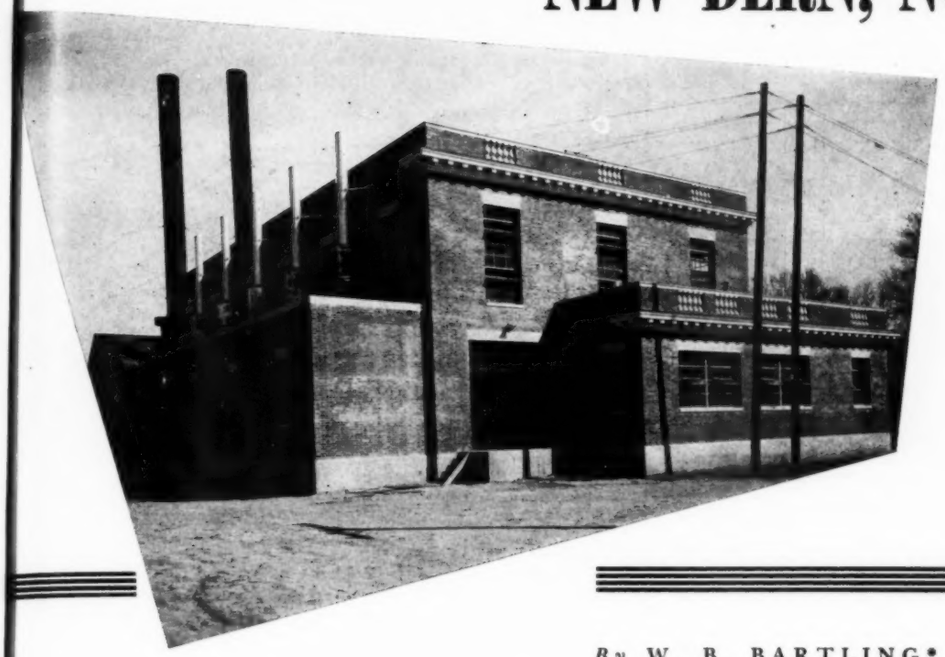
of the 5 in. x 16 in. control cylinder. This condition represents a compromise to maintain a standard 5 in. bore on all cylinders, and to keep the stroke of the largest cylinder within a practical limit. Our experience has shown that from 2½ to 3½ seconds is a satisfactory operating rate for a control cylinder on the heavy duty type implements. This is the time required to actuate the control cylinder from completely retracted, to fully extended position. The operating rate determines the pump delivery capacity required to satisfactorily operate each size control cylinder. All control cylinders are of the double acting type. A double acting cylinder is required to control and maintain the working angle of an offset disc harrow, and its use is advantageous on other implements.

"Standardization Program — Origin and Basic Scope: Developments made in the application of hydraulic controls for drawn implements have been demonstrated in the Middle Western farming operations with wheel tractors, as well as here in the West with larger crawler tractors. This fact was recognized by the Advisory Engineering Committee of the Farm Equipment Institute. As a result, early in 1945 a committee was formed to study the subject of hydraulically controlled drawn implements. This committee was interested primarily in the smaller equipment used with wheel tractors. Elmer McCormick, Chief Engineer of John Deere Company, was appointed chairman.

"This committee undertook the difficult problem of developing a set of standards for certain dimensions of the control cylinder, of its location on the implement, and of the clearance requirements on the implement. Successful completion of this undertaking would permit complete interchange and satisfactory operation of any make of drawn implement with any make of hydraulic control equipment.

"West Coast Sub-Committee: About a year ago, a West Coast sub-committee on hydraulic control standardization was appointed. Committee members included Mr. Rasmussen of Deere-Killefer, Mr. Kaupke of International Harvester, Mr. Brown of Caterpillar and myself. We have undertaken the same general standardization program as applied to the larger deep tillage implements and crawler tractor operations. Our program includes the same ultimate goal—that of complete interchange of hydraulic control equipment with any make of implement. The realization of this goal involves the determination of a set of standard dimensions which would establish: (1) For the cylinder—the pivot center distance, the length of stroke, pivot pin diameter, maximum outside diameter, and the type of pivot connections; and (2) For the control cylinder mounting—the location of the cylinder on each implement with respect to a fixed standard point on the tractor. Recognition of the size range, and the diversified equipment which we must consider makes our problems more perplexing."

NEW BERN, NORTH CAROLINA



Five 100-H.P. Turbocharged Diesels Replace Steam Turbine Generators in Southern Municipal Plant.

By W. B. BARTLING*

THE city of New Bern, North Carolina, County Seat of Craven County, is located at the junction of the Neuse and Trent rivers, about 35 miles from the Atlantic Ocean. Founded in 1710, it is a namesake of Bern, Switzerland. Swiss and German colonists, seeking religious and political freedom founded the town on a tract of land granted by Queen Anne of England.

New Bern, a city of much cultural charm and historical tradition has a population of over 20,000 people. The visitor will find many fine old homes, with 130 of them having been built over a century ago. The emphasis was, and is, on the Georgian and colonial architecture.

New Bern has much to offer in tradition, charm and architectural beauty, warranting the time of those interested in the study of homes, both new and old.

Industrially, New Bern ranks well up on the list for cities of its size. Surrounded by productive farm lands, and forested areas, industries resulting are related to the basic materials available. Ranking first are lumber mills, veneer mills, and allied timber products. Second are the boat works, which built mine sweepers, salvage vessels and net tenders for the U. S. Navy during the war, but are now reconverted to the output of commercial and pleasure craft. The seafood business and tobacco and food processing plants follow in that order.

The New Bern Municipal Water & Light Plant was started in 1902, experiencing the many problems that confronted such a venture in those days. The small steam generating unit then installed was soon overloaded and a larger unit was necessary. In the days of pioneering the generation and distribution of electrical energy, the problem of continuous service to all customers was indeed very difficult.

In 1913 the City purchased a Corliss engine driving a 400 kilowatt engine type generator, this unit being of sufficient capacity for about 4 years. In 1918 when the unit became smaller than the load requirements, a 750 kw. steam turbine driven generator was installed, at a cost of $42,000, being paid for out of the plant earnings. When, in 1924, additional generating capacity was required, a 1250 kw. steam turbine unit was purchased, followed by a 2500 kw. machine, in 1930, this being the last unit purchased prior to conversion to diesel prime movers.

It is interesting to note the growth of the number of customers being supplied over the years. In 1917 there were 600 customers being served, with the annual receipts $60,000. In 1921, the first out of town electric line was built by the city, and in 1930, a rural line serving a considerable number of farms was added. In 1933 there were 2,887 patrons of whom 251 were on rural lines. By 1936 there were 3200 customers with 385 living along rural extensions. At that time the city owned rural lines had grown to a total of 86 miles.

In 1940 there were 4,000 customers being served by the Municipal Power Plant, of whom 850 were in the rural community outside of the city limits.

By July 1, 1947, there were a total of 7630 electric meters, with 4,265 accounts within the city, and 1,280 in rural areas. The city owned rural lines had increased to 150 miles. For the year then completed, the electric receipts were well in excess of a half million dollars.

By 1940 it was clearly evident that replacement boiler capacity would be needed, in addition to complete modernization of the power plant, if it was to be able to continue on an economically sound basis. World War II cut short any further thoughts of such power plant improvements. In the meantime, with the city being unable to generate sufficient energy to handle the load, a tie-in with the Tide Water Power Company permitted the municipal plant to keep operating and serve the requirements of the community.

In April of 1945, the city entered into a contract and McDonnell Engineering Company of Kansas City, Missouri to furnish a detailed report giving recommendations for the future course of the municipal plant. This report clearly showed that the existing equipment had passed its period of economic utility and in addition was too small, insofar as total dependable power was concerned, for the present and anticipated growth of the city's needs. As a result, four possible methods of supplying the electrical requirements of New Bern were studied in detail. These four possibilities, as covered by the report were as follows:

1—*Purchased Power*

Under this plan it was proposed to purchase all of the electrical energy required to serve the city of New Bern with figures presented being on the basis of a period of ten years.

2—*Steam Plant*

Under this plan, the installation of a 3500 kw. turbo generator unit was considered in addition to new boiler equipment, and modernization of fuel handling methods, and auxiliary equipment.

3—*Three Unit Diesel Plant*

Under this plan, the installation of three diesel units, each rated approximately 2600 hp. with 1800 kw. generators was considered, including new switchgear and auxiliaries, and of course a new building.

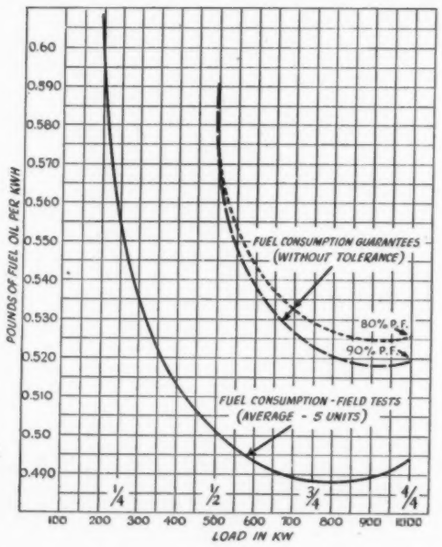
4—*Five Unit Diesel Plant*

Under this plan it was proposed to erect a new

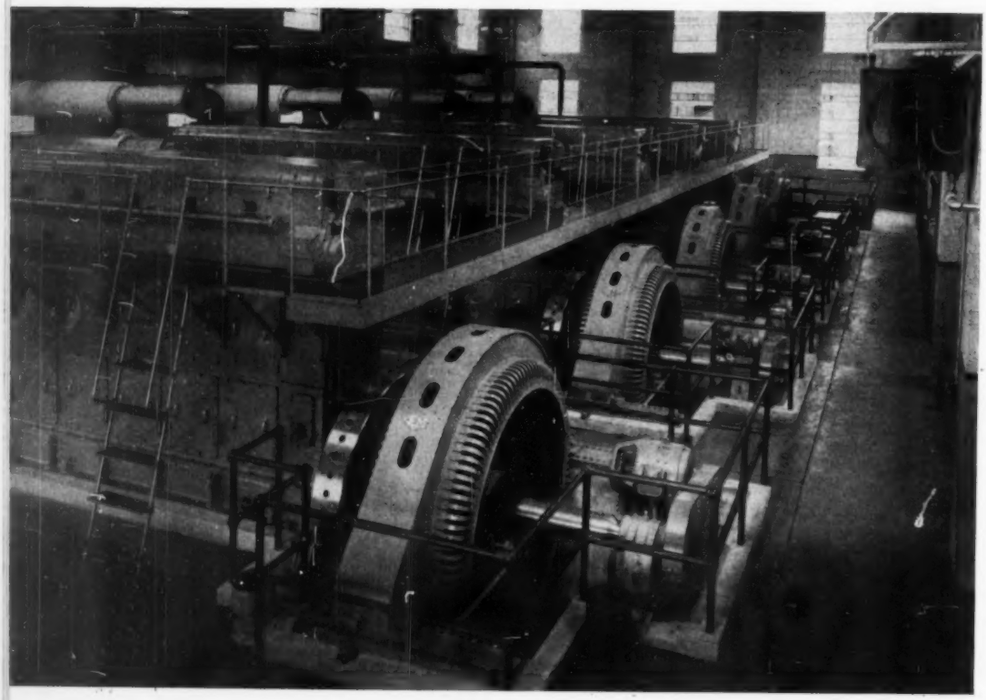
* *Superintendent, Municipal Power Plant, New Bern, N. C.*

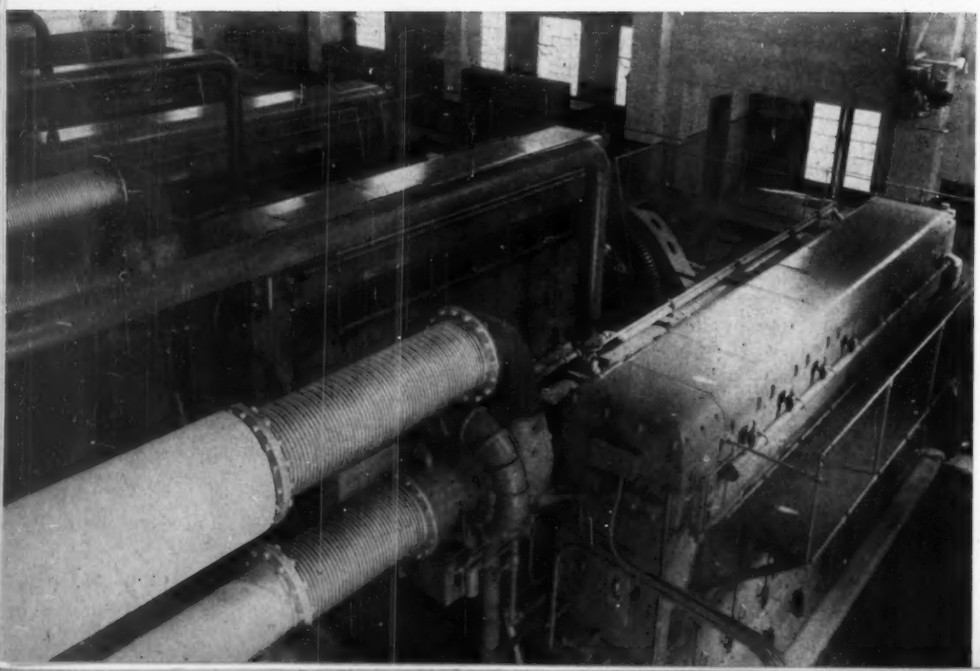
power plant, containing five diesel generator units, each to be approximately 1000 kw. in capacity.

A comprehensive analysis of the four possibilities was submitted, based upon anticipated load increases in future years, together with estimated cost of materials, supplies, and services. The average cost per kilowatt hour generated, considering both operating cost and investment cost, was determined, with these figures being compared with the proposal submitted by the utility for purchased power. It was the conclusion of the Engineers that the installation of the five unit diesel power plant was the best procedure for the City of New Bern. As a result, the Board of Aldermen soon authorized the consulting engineers to proceed with plans and specifications. The bids on



(Below) Newly installed diesel plant at New Bern comprises 5 supercharged Superior diesels driving 1000 kw. Electric Machinery Co. generators. (Right) Fuel consumption chart for diesel plant.





the power plant equipment were taken in December 1945. The proposal of the National Supply Company, Springfield, Ohio, covering the engines, generators, and auxiliary equipment was considered to be the best bid and as a result the contract was awarded to them. Auxiliary equipment included Woodward governors, Maxim silencers, Air Maze Air filters and silencers, Purolator fuel oil filters, Hilliard lube oil filters, Quincy air compressors, Ross heat exchangers, and Alnor pyrometers.

The Board of Alderman exercised the option offered by the National Supply Company bid—the right to select the manufacturer of the generators and exciters—and picked the Electric Machinery Mfg. Company, Minneapolis, Minnesota.

The switchgear equipment contract was awarded to the Westinghouse Electric Corp.

The induced draft cooling tower was manufactured by the Marley Co.

At a later date, bids were received on the building construction, with the contract being awarded to H. A. Kuljian & Company, Philadelphia, Pennsylvania who selected as their sub-contractor, on the switchgear installation and power wiring, the Triangle Electric Company of New Bern.

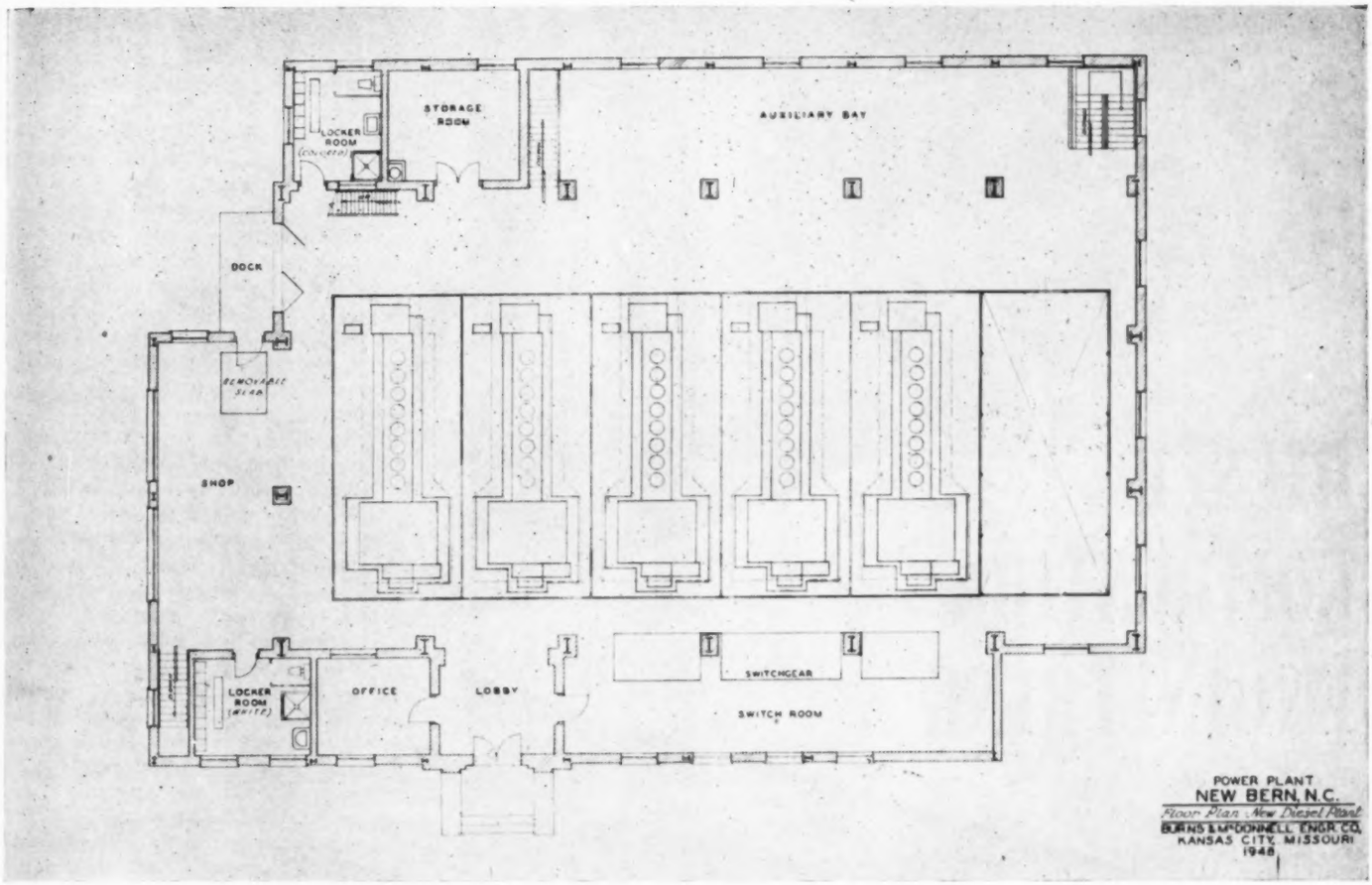
The five diesel engines were manufactured by the Superior Engine Division, National Supply Company. They are eight cylinder, 14½" bore by 20" stroke, running at 360 rpm. They are supercharged, with a BMEP of 120 pounds per square inch, resulting in a rating of 180 hp. per cylinder, or 1440 hp. per engine, thereby handling the 1000 kw., Electric Machinery Mfg. Company generators. The engines are of a four cycle, mechanical injection type.

The bedplates are cast of semi-steel with flanged, heavily ribbed transverse members forming the main bearing supports, line bored with their respective bearing caps. The cylinder blocks are also of semi-steel and are single castings of box type construction. Large doors and cover plates give free access to main and crankpin bearings, fuel pumps, and permit cleaning of the water jackets. The cylinder blocks are fitted with removable interchangeable liners, free to expand at the bottom, by a sliding fit sealed against water leakage by rubber packing rings. Each crank shaft is forged from a solid billet of heat treated steel. The main bearings are of split, precision type. It is not necessary to remove the crank shaft to replace either the upper or lower half of the bearing.

The cylinder heads are cast from a semi-steel mixture, proportioned to insure equal expansion and contraction. Each head is fitted with two inlet and two exhaust valves, mounted in cages, a spray nozzle assembly, an air starting check valve assembly, a cylinder pressure relief valve assembly, and a combination indicator and snifter valve assembly. All of these valves seat in cages or separate bodies. The inlet and exhaust valves are interchangeable, with exhaust valve cages being water cooled.

The pistons are cast of a special semi-steel mixture, machined and ground to close limits, and fitted with five compression and three oil regu-

Turbocharged on the Elliott-Buchi system, diesels develop 1440 hp each at 360 rpm. Westinghouse switchgear is seen in background.



Floor plan of New Bern plant shows machinery arrangement with provision for additional diesel installation when required.

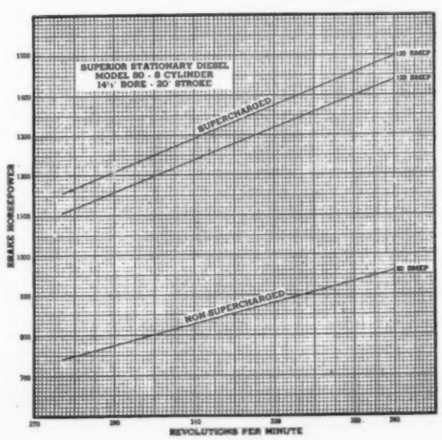
lating rings. The top of piston is dished making the open type combustion chamber compact in order to conform to the pattern of a centrally injected fuel spray.

Turbo super-charger equipment is of the Buchi type manufactured by the Elliott Co. Being entirely self contained, it is connected to the engine only through the exhaust and air intake manifolds. It consists of a gas turbine driven by the engine exhaust and driving a centrifugal blower which supplies, under pressure, through the conventional air intake manifold, all the air required by the engine. The operation of the super-charger is fully automatic at all loads, and no control devices are necessary. The exhaust manifold is water cooled.

The E-M generators are of the fabricated steel construction. The stator frames are of heavy box type section with the strength of the frame itself being dependent only on the frame component parts, and not on compression of the armature core laminations. For the purpose of streamlining the generator appearance to line up with that of the engine, as well as to assist in normal maintenance problems, the generator stator frames were so designed that the bottom of the soleplates, on which the generator feet rest, lines up with the bottom of the engine bedplate. Parallel core tightening is available through the combination of spacer rings and many clamping plates around the side of the generator. The Class A armature coils of the moisture resisting type are secured in the slots with horn fibre wedges, and use continuous lashing rings around the entire periphery of the end turns of the coils, strengthening them for shock loads and possible vibration.

The rotor spider, of the revolving field assembly, is also of fabricated steel construction, heat treated to remove possible stresses from the welded joints. The ammortisseur or damper winding is phos-copper welded at all joints, to insure permanency of high dampening torques, desirable for good paralleling characteristics. Should maintenance require the replacement of a field coil, the phos-copper welding material can be removed from the joint between poles with a blow torch, without injuring the parent copper of the end rings or damper bars themselves.

Power curve for Model 80 Superior diesel showing increased power output available with turbocharging.



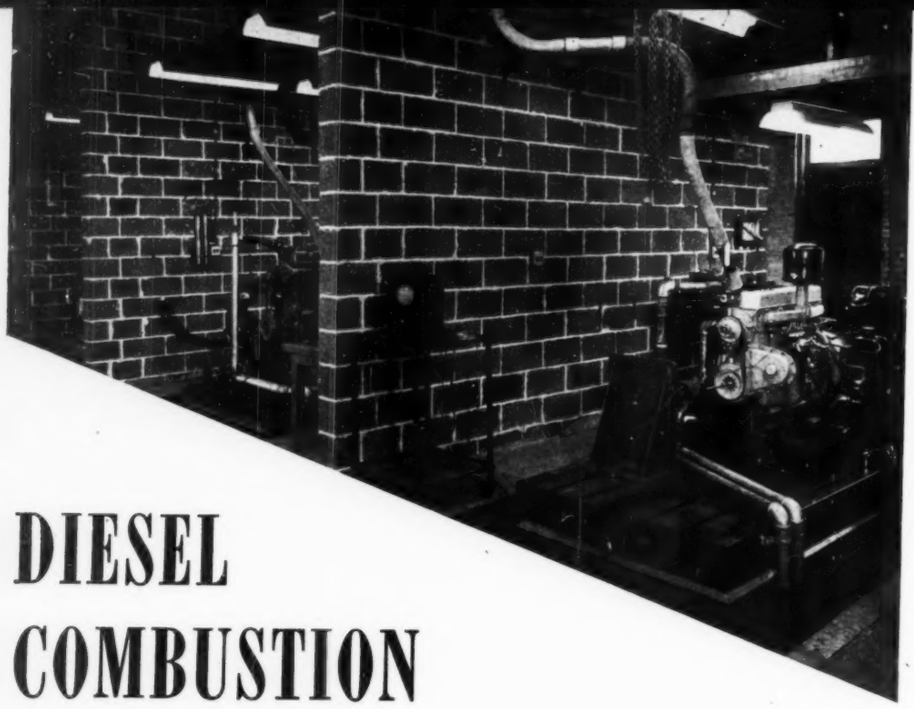
The chain driven exciters are rated 15 kw., 1750 rpm., 125 volts and are shunt wound. They were designed with rate of response and saturation curve characteristics such that they are coordinated with the synchronous generators and voltage regulators to maintain a steady accurate output line of voltage.

The modern building housing the power plant was designed with reference to the Georgian architecture to make it harmonious with the general plan of predominant New Bern architecture. Space is available for a sixth unit, which can be installed when load growth warrants it.

The field tests run on the diesel engine generating units by Burns & McDonnell, show that all machines appreciably exceeded the guarantee as made.

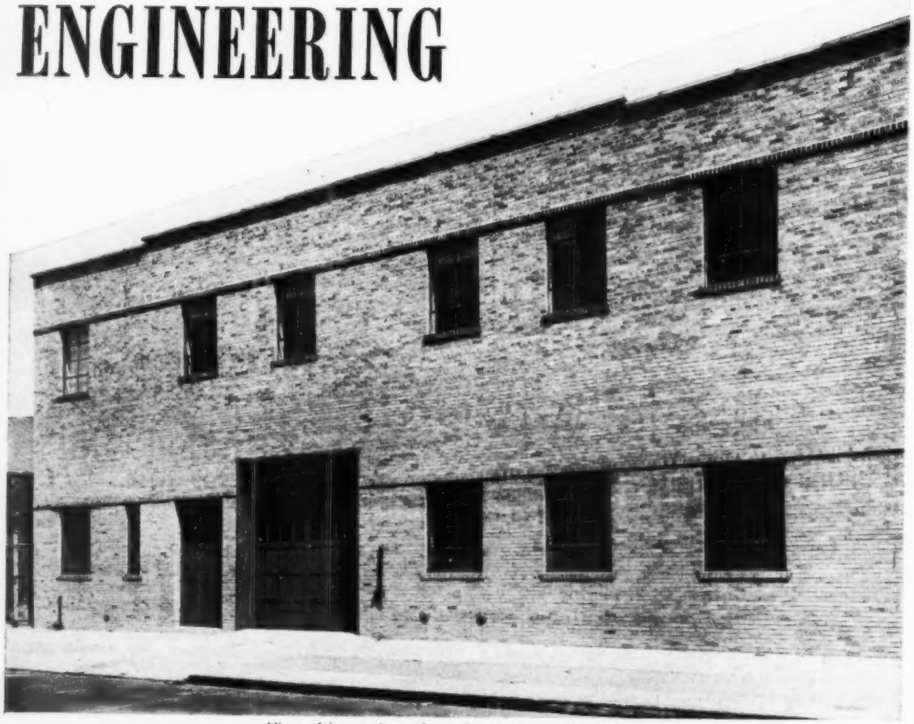
Two fuel oil storage tanks, each of 60,000 gallons capacity, were installed. It is contemplated that the fuel oil will be brought up the river by barge, from coastal tankers, and pumped directly from the barge to the fuel tanks due to the proximity of the power plant to the river.

The first unit was put on the line at 2300 volts, on December 8, 1947. As the distribution system was being cut over from 2300 volts, to 4000 volts, to increase its capacity, it was not until March 14th, 1948 that the plant went into full service, and the steam plant was shut down. On March 21st, the City formally dedicated the new plant with a fitting ceremony.



Two of the four engine testing bays at Lanova plant show test engines on stand.

DIESEL COMBUSTION ENGINEERING



View of Lanova's modern plant in Long Island City.

IN 1944 the Lanova Corporation, under a new management, initiated a program of research and service designed to help solve the problems of the diesel industry. Since then, this outstanding research and developmental organization has made rapid strides in the field of combustion engineering.

To those who are not familiar with the Lanova Corporation, a brief summary of its organization and its unique method of operation provides an interesting sidelight.

The Lanova Corporation owns the exclusive patent rights to the Lanova Combustion System. This system involves a special cylinder head design which represents a major step in providing diesels with the turbulence needed for efficient combustion at high speeds. Its inherent low pressure characteristics make practical the direct conversion of gasoline engines to diesel operation without extensive changes in design. These features make the use of the System feasible to American diesel manufacturers, many of whom produce both gasoline and diesel units and can thus realize savings on the interchangeability of parts thus afforded.

Lanova licenses manufacturers to build and sell diesels embodying the Lanova Combustion System. Although Lanova does not undertake any manufacturing operations itself, it does agree to perform the necessary design and laboratory work to adapt the System to licensees' engines. The licensees pay for the cost of this work and further compensate Lanova by royalty payments based on the sale of their engines.

From its founding in 1931 until 1944, Lanova gained a number of outstanding American diesel manufacturers as licensees. During this period Lanova handled the routine problems related to the conversion of licensees' engines to the Lanova-type diesel. Several of these original licensees augmented the work done by Lanova with independent research programs of their own.

When the new management came in late in 1944, its new president, Frank H. Woodman, felt that Lanova could be of far greater service both to its licensees and to the industry as a whole, if it broadened the scope of its activities to include work on improvements and new developments which would further enhance the efficiency of Diesel operation. This plan has been put into practical application.

Word went out to Lanova's licensees that the patent holding company was undertaking an accelerated program of engineering and research and was offering its facilities for extended concentration on its licensees' problems. With the know-how gained from dealing with diesel combustion problems exclusively, this offer meant that Lanova's experienced organization would act as a valuable and active supplement to the engineering departments of the licensees. A further step was taken when Lanova liberalized its licensing agreements and readjusted royalty fees in order to encourage more extensive use of the System.

Most important of all, a streamlined engineering program was formulated under which more time and effort could be devoted to the study of diesel combustion problems and related phenomena. Lanova's engineering force under Vice-President and Chief Engineer William Hamilton and Designer James Brady began a series of investigations on combustion and related engine problems, many of which are still in progress. To facilitate these operations and to speed the development of improvements, laboratory and test equipment were refurbished.

This expansion has led to the recent construction of a new and larger laboratory, especially designed to provide Lanova with a more efficient and flexible arrangement in which to carry on its work.

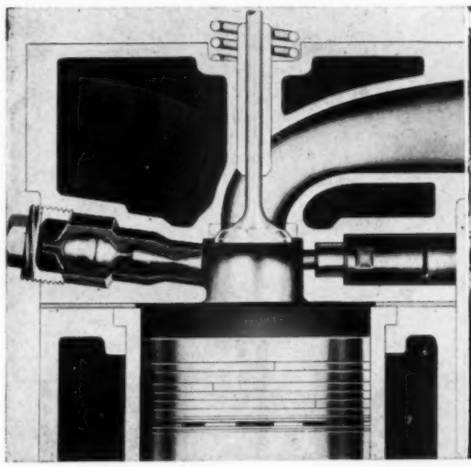
The laboratory is divided into two parts. One section is devoted to the actual testing of engines and equipment. Individual engine bays line one side of this test area. These bays are designed so that engines can be readily installed and removed for complete tests and tuneups. For this purpose, various test devices are used. These include instruments for measuring rates of injection—a sensitive oscilloscope for tracing cylinder pressures—nozzle test devices—stroboscopes, etc. In fact, the laboratory is completely equipped to investigate almost any phase of engine design or operation which might have a bearing on combustion.

The other half of the laboratory is occupied by a machine shop capable of handling any necessary alterations in design and of building special parts

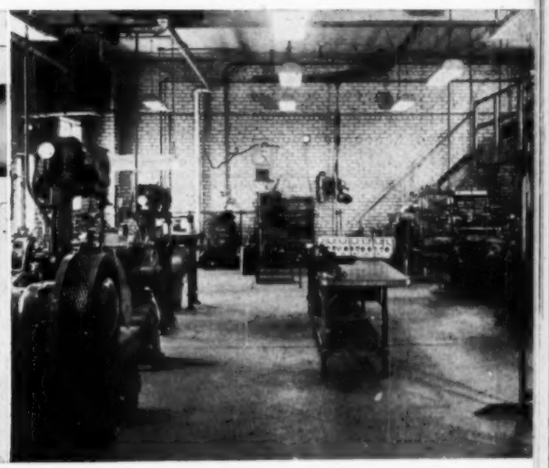
for the test engines. Routine maintenance jobs are also performed here. The close proximity of the shop to the testing department enables Lanova to maintain close control over exacting tolerances and dimensions and makes possible speedier machining operations so as not to cause undue interruption of tests that might be in progress.

Now, when a new licensee contracts with Lanova, the existing drawings of the licensee's engine are carefully studied and a Lanova chamber is evolved to fit the design and operating requirements of the engine. Then a casting is made of the experimental Lanova-type head and the necessary parts are machined for the test engine. After assembly, the experimental engine is installed for testing in the Lanova laboratory. Here, under the personal direction of the Chief Engineer, its performance is carefully measured and the data thus obtained is checked and analyzed. During the tests, changes are made to determine optimum compression ratio, optimum rate and duration of injection, best injection and nozzle opening pressures, and experimental energy cells with varying chamber and orifice designs are tried in order to get the best combination for the particular engine.

As the work progresses, periodic reports are sent to the licensee's engineers to keep them informed of the changes. Testing is finally completed when optimum operating conditions have been established. At this time, a formal report complete with working data and designs is submitted to the licensee. The time that is usually required to complete a conversion from start to finish is around three months, depending upon the complexity of the job. If the licensee desires, Lanova engineers will cooperate further by assisting in putting the new engine into production or in advising where changes can be made to simplify the production problems involved.



Simplified view of Lanova combustion system "energy cell" at left, fuel injector, right.

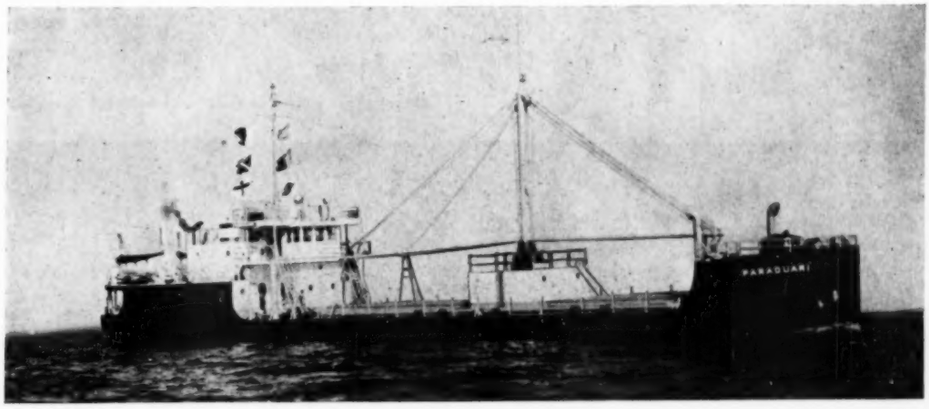


Machine shop is well equipped for experimental design work in diesel combustion engineering.

The conversion of licensee engines constitutes a major portion of Lanova's work, and is by far its most important function. Yet under its newfound philosophy of greater service to the industry, Lanova has been developing improvements on its designs to insure even greater operating efficiency. At the same time, the company has instituted a program of independent research in fields that are only indirectly akin to combustion. Cooperating with Lanova in this particular phase of its activities are such well-known and able engineers as Frederick Nettel and Dr. John Kreitner. Their combined efforts have resulted in some outstanding developments which, on the basis of preliminary estimates, are revolutionary in their effect on diesel engine performance. This work has been a carefully guarded secret to date. It will not be announced until Lanova has complete assurance that expected results are proven results. However, in line with Lanova's avowed policy, full details will be made quickly available to the industry when they are ready.

For Lanova the new philosophy of service and research has begun to pay off. Four new licensees have been added by the new management. The older licensees are once more aware of the important services Lanova can offer in testing, developing new designs, and increasing the capacity of present designs. The new management has, in fact, started out with a record of positive accomplishment which gives every indication of establishing Lanova as a vital contributing factor in the advancement and betterment of the diesel industry.

FOUR DIESEL SHIPS FOR PARAGUAY



THE first four ships establishing the Paraguayan State merchant marine have been delivered to Asuncion, Paraguay. Admiral Ramon Martino, Paraguayan Defense Minister, received the first two vessels, the *Paraguari* and the *Lago Ypacarai*, at a ceremony recently at Long Beach, California, when the President of the Korody Marine Corporation, Paul A. Korody, formally transferred the ships to the Paraguayan Government.

The vessels, originally U. S. Army Coastal "Y" tankers of 1500 tons displacement, are of twin screw all-steel construction. They were converted to cargo ships by the Korody Marine Corporation of New York and Long Beach and H. Newton Whittelsey, Inc.

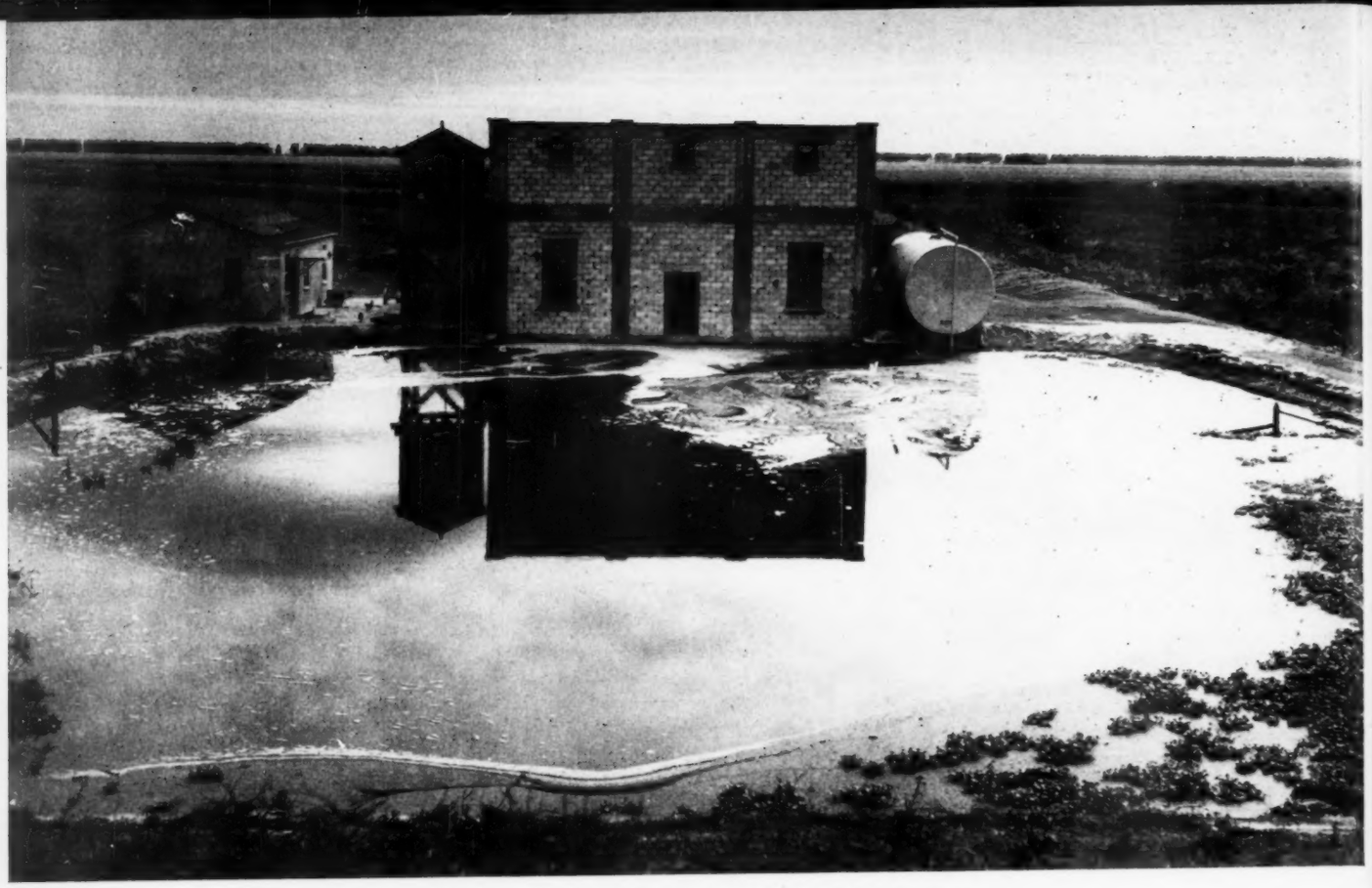
The *Lago Ypacarai* was refitted as a light oil carrier. The other vessels, the *Paraguari, Ypora* and the *Ygurey* have been converted to dry cargo ships, each equipped with two hatches served by four 5-ton booms. Their after-conversion displacement is 1475 tons giving a deadweight of 985 tons and a grain cubic of 38,000 feet. The classing work was accomplished by Moore Shipbuilding & Drydock Co. at Oakland, California, while the conversion was done at Cavanaugh Machine Works, Wilmington, California.

All four ships were built in the United States in 1945 according to the Odenbach system of channel construction; one was built by John H. Mathis, Camden, New Jersey, two by the Florida Shipbuilding Corporation, Ojus, Florida, and one by Kane Shipbuilding Corporation at Galveston, Texas. Three are fitted with two Cooper-Bessemer 6 cylinder 9 in. x 10½ in. engines and the fourth with two Wolverine 6 cylinder 9¼ in. x 14 in. engines.

American Bureau of Shipping originally classified the vessels as *A1 E Oil Carrier and *AMS. All four of the vessels were put through special survey No. 1 by ABS and reclassified in their highest class.

Principal Dimensions

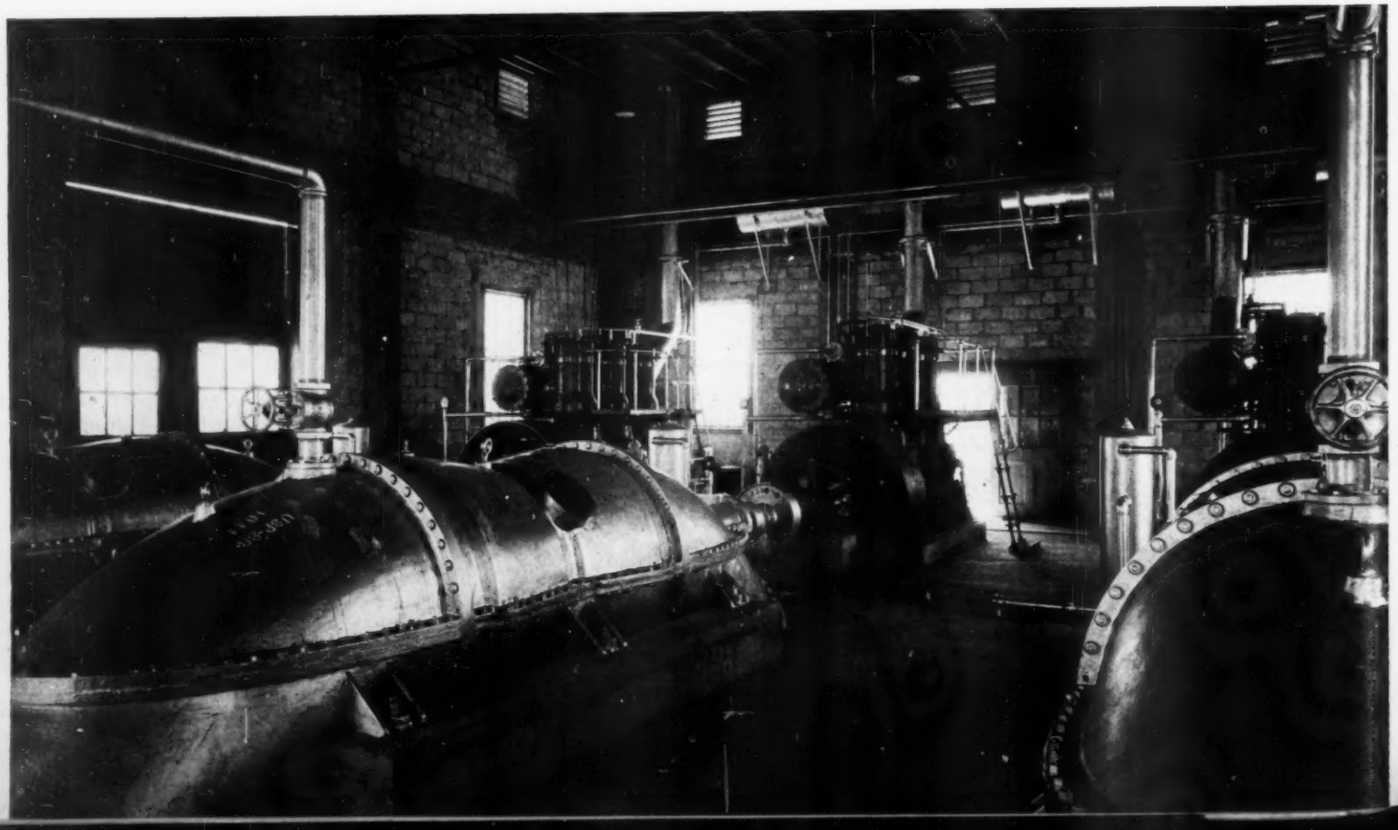
L. O. A.	182 ft. 6 in.
Beam	30 ft.
Depth	13 ft. 6 in.
Loaded Draft (Tanker)	11 ft. 2¼ in.
Loaded Draft (Cargo Conversion)	11 ft. ¾ in.



Pump house for East Shore Drainage District houses diesels and pumps

DIESEL PUMPS TAME THE EVERGLADES

Engine room of pump house with 3 Fairbanks-Morse diesels installed



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JULY 1948

Reclamation plan for district shows location of pumping plant and drainage canals.

By HARRIE H. BIERMAN

DRAW an east-to-west line across the Florida peninsula, westward from Stuart. Draw a similar line westward from Palm Beach. In the eastern half of the parallelogram thus formed lies a saucer-like, water-filled depression about 40 miles long and 30 miles wide—Lake Okeechobee. The latter is the second largest body of fresh water *entirely* within the territorial limits of the United States.

Lying in the heart of the vast wilderness known as the Everglades and fed by the Kissimmee and other central Florida rivers, Lake Okeechobee has been an engineering problem-child for over 100 years. In 1847, with a view to opening up additional arable land for settlement, the U. S. Government sent engineers into the Everglades in the vicinity of Lake Okeechobee to report on the possibilities of "reclaiming" 'glades marshland for cultivation. The engineers reported that the possibilities for reclamation were good but an extensive drainage operation was necessary. However, nothing much was done about it at the time.

Sixty years later, the reclamation dream became a reality, when 16 canals were cut through the marshland to the ocean. Between 1909 and 1911 the number of homesteaders in the region around Lake Okeechobee rose from about a dozen to 15,000. In 1913, the Florida Legislature took official cognizance of the situation by creating the Everglades Drainage District, as an over-all authority to take control of the entire drainage project.

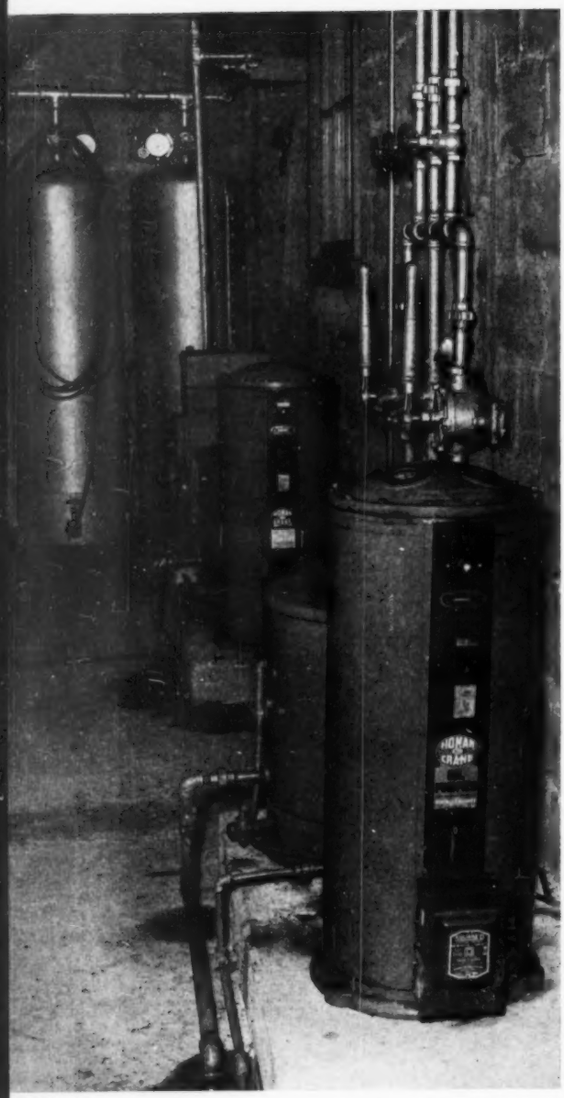
Later, it was to be discovered that canal drainage, alone, would not make the Everglades a suitable place in which to live or to carry on agriculture. The canals could not carry off excess water fast enough in time of flood or put water back on the land during drought. The soil of the 'glades is rich but it has peculiarities of its own. Called "muck," it was formed by long centuries of plant growth and decay in endless cycles. It holds water like a sponge but gives up its moisture readily to a hot sun and evaporating winds.

Flood conditions stem from either of two sources: (1) tropical storms and (2) excessive rainfall. The 1926 and 1928 storm winds spilled thousands of tons of Lake water over the land, killing 2,000 persons and destroying 50 million dollars worth of property. Later, U. S. Army engineers built 68 miles of levee around the southern rim of the Lake. To date, that levee has ended storm overflow. *But it didn't terminate the flood hazard.*

At Miami, where precipitation records have been kept for 62 years, the annual average rainfall is 58.64 inches. Of this, three quarters falls between May and October. Precipitation records inside the 'glades have not been kept for a period sufficiently long to provide a long-term average but meteorologists estimate it at about 15 inches per year more than at Miami. In 1947, the year's rainfall in parts of the Everglades, at least, was close to 8 feet.

The canals just couldn't carry it off fast enough. Result: the low lands as far south as communities on Miami's northern fringe were drowned out. Residents had to be removed by boat.

But not all years are "wet" years. Those from 1943 through 1946 were *drought* years. Precipitation was only a fraction of what it should have been. In drought years, the "muck" becomes as dry and inflammable as tinder. A carelessly tossed match can start—and often has started—a fire, which literally "burns up" the peat-like soil. Completely destroys hundreds of acres of it.



Honan Crane lube oil purifiers installed at pump house —one for each engine.

The Everglades drainage canals, which empty into tidewater, are part—and only part—of the over-all drainage plan. Water control in a specific area must be provided by a local drainage setup. Applied, as yet, to only a portion of the area, for which eventual drainage is envisioned, there, now, are about a dozen of these local water-control "districts."

Under the general supervision of the Everglades Drainage District, these local water-control units have, each, its own supervisory board to deal with the unit's individual problems. Collectively, these local drainage districts provide specific-area water control for approximately 2,000,000 acres. In total, the Everglades contain, roughly, 5,000,000 acres—but not all of this land is arable.

Such a unit is the East Shore Drainage District in Palm Beach County. Located between Belle Glade and Pahokee, the "district" consists of 8,000 acres of rich agricultural land. On the map, it's merely a numbered township. East Shore's chief problem is the general one of the entire Okeechobee region: to remove from the land excess water—when there is an over-supply—and to put back enough water, in times of drought, to remedy the under-supply. And that is exactly what East Shore District purports to do—and does.

During last Fall's flood conditions, the District. the major crops of which are sugar cane, potatoes, celery and beans, was not enough flooded out to seriously prevent normal crop-production routine. So says R. Y. Patterson, chairman of the District's Supervisory Board and Vice President in Charge of Engineering for U. S. Sugar Corporation. The latter, incidentally, is heavily interested in Okeechobee-region agriculture.

Mr. Patterson's statement rather surprised the writer, because, when the latter visited the East Shore District, in late November, flood conditions along the highway from Miami to the Okeechobee area were somewhat more than plainly visible.

The East Shore District, bounded on one end by the Government levee, is bisected by a longitudinal canal, which carries the water flow toward the Lake. To prevent the inflow of water from adjacent land, the other three sides of the District are diked, also—a part of the District's own project. This "main canal" is intersected by 10 transverse canals or "laterals." These canals are designed to drain off surface water but they do more than that. There is, also, the matter of sub-surface water.

As has been explained, the peat-like soil holds water like a sponge. Surface water precipitated, during heavy rains, seeps into the soil, before it can be drawn off as surface moisture. To dispose of this excess sub-surface water, East Shore threads the inter-lateral spaces with down-slanted tunnels called—appropriately enough—"mole holes." These serve as pipes to channel the under-surface water to the laterals. The placing of these "mole holes" is effected by a tractor-drawn implement termed a "mole."

Thus, here is the District's water-control pattern: the land within the District is diked off on all four sides to keep out all surface water, except natural precipitation or storm driven water from the Lake. Government dikes have taken care of the latter hazard during all storms in the area, since the dikes were erected. The Government levee, incidentally, has a height of 34½ ft. above sea level. The District's own canal-system is designed to handle all surface water. The mole-hole system takes care of sub-surface seepage. Seems pretty good doesn't it?

But East Shore's Board of Supervisors didn't think so. They don't depend on Nature, alone, to dispose of their excess water. Moreover, Nature hasn't proven too dependable for providing needed water during drought years. As pointed out, the District consists of crop-growing land. So the District Board of Supervisors installed a two-direction pumping installation that is geared to handle 180,000 gallons of water per minute.

Pumped-out water goes in a drainage basin on the land-side of the Government levee. Runs into the Lake through a culvert. At the time the accompanying photo was made, the water in the drainage basin was at least 6 ft. above normal. Basin was sandbagged to hold water at higher level to provide a gravity run-off into the Lake, which, also, was above normal level, due to excessive rainfall mentioned. Pumping installation is at the Southeast end of the Lake.

Housed in a concrete-and-steel structure, 44 ft. by 66 ft., the installation's chief items of equipment are made up of three Fairbanks-Morse Company 32-E-14 diesel engines and three F-M 54 in., horizontal, propeller-type pumps, designed to handle 63,000 gallons of water per minute, each, at 7 ft. T.D.H., and direct-connected to the engines by F-M pin-and-bushing-type, flexible couplings. These diesel-powered pumps provide the District with a water run-off of 1 in. every 24 hours. Reverse-direction propellers are a part of the equipment.

The diesels are the vertical, 2-cycle type with 14 in. bore and a 17 in. stroke. They are rated 225 hp. at 300 rpm., and are compressed-air started.

Two F-M gasoline-engine-powered Model H compressors provide a positive air-supply for engine starting. Four 20 in. by 60 in. steel tanks store air at 250 lbs. pressure. The two gasoline engines (F-M) for powering the compressors are 3 hp., Type Z.

Fuel oil (Texaco) for the diesel engines is stored in an outside tank with a capacity of 12,000 gals.—the equivalent of 1½ tank cars. The fuel oil filter used is of F-M manufacture—is part of the engine equipment. Fuel consumption is at the rate of .37 lbs. per horsepower per hour. The lube oil used is Gulf "Parvis 20," filtered through a Honan-Crane filtering unit.

The heat used in connection with the oil purification process vaporizes any moisture content and raises oil viscosity, with a consequently free flow. The over-all equipment installation contains 3 H-C purifying units—one for each diesel engine.

Engine equipment includes no silencer. None is needed. The engine house and the cottage next it, occupied by B. C. Hare, plant engineer, and his family are the only structures visible from the elevation of the nearby Government levee. Moreover, the vast masses of adjacent water seem to act as sound-absorbers. Outside the engine house one isn't conscious of the engine exhaust. The exhaust pyrometer is Alnor. The intake air filter is a Burgess. Engine governors are F-M with manual speed control. There is no vibration or noise insulation. None seems to be needed.

Each of the engines powers a 2½ kw. F-M generator, which produces 115-volt, AC current for engine-room lighting. Nine 200-watt lamps supply all necessary illumination. Except at night or on cloudy days, ample window openings furnish plenty of natural lighting. The diesel engines power the generators by means of 3 Gates V-belts each. The pulley sheaves, by means of which the generators are powered, are mounted on the engine-to-pump shaft, btween the engine and the flexible coupling, above mentioned.

The "soft" water used for engine cooling is rain water. The latter, which is caught on the engine house roof, is stored in an outside tank having a capacity of approximately 3,000 gals. Circulation of engine-cooling water is effected by an F-M centrifugal pump, which is a part of each engine's equipment. Pump priming is accomplished by means of an Apco, 16 in. x 48 in. automatic primer. The type of heat exchanger used is Ross. Included in the cooling-water circulatory system is an expansion tank for each engine.

The F-M circulatory pumps are driven by the engine-to-pump shaft by means of 2 Gates V-belts for each engine.

YACHT "FRAMAR"

Owner Wheaton observes operation of Sperry Magnetic Compass Pilot aboard *Framar*

Diesel yach *Framar* — triple screw—with three General Motors Diesels installed

THE Wells-designed *Framar* is a trim Diesel yacht. Built by Stowman Shipyard, Inc., in late 1946, this 85-footer is now owned by Frank H. Wheaton, Jr. She is built with oak keel and frames with a double planked hull with cedar inside and Honduras mahogany outside. Her decks are teak laid over prestwood while her deckhouses are mahogany. Her power plant consists of three General Motors Diesels, 6 cylinder rated at 200 hp. each. They drive three propellers for a speed of 13 knots. A 32 volt starting system, battery fed, is installed. Auxiliary power is supplied by a U. S. Motors Diesel generating set.

Among the many features of the *Framar* is the Sperry Magnetic Compass Pilot, one of the first to be installed on a yacht. This development means automatic steering for small vessels since the equipment combines a standard magnetic compass with control mechanisms in a light weight installation. A controller, mounted on the compass, enables the pilot to select his course. The Sperry pickoff then senses the compass reading and applies control through an amplifier to the steering engine. A remote controller, cable-connected to the equipment permits steering from positions away from the helm. The *Framar* is equipped with a No. O Sperry steering engine for automatic steering.

DEMA EDUCATIONAL PROGRAM DISCUSSED AT ST. LOUIS

Left, Rex W. Wadman, Editor and Publisher of "Diesel Progress" addresses a few remarks to the DEMA luncheon at St. Louis. Seated around table left to right are Ralph Miller, Chief Engineer, four cycle diesel division, Nordberg Mfg. Co.; Harvey T. Hill, Executive Director, DEMA; Gordon Lefebvre, President, Cooper-Bessemer Corp. and President, DEMA; Rex W. Wadman; Robert E. Kirn, C. Lee Cook Mfg. Co. (behind R. W. Wadman); Knute O. Keel, Chief Engineer, Cleveland Diesel Engine Division, General Motors Corp.; and R. L. Fielding, Vice President and General Sales Manager, Commercial Filters Corporation.

FOR the first time since launching its five year educational program, the Diesel Engine Manufacturers met recently at St. Louis with 30 cooperating parts, accessory and oil companies, and took stock of the training job in which all are engaged.

Gordon Lefebvre, President of the Cooper-Bessemer Corp. and President also of DEMA, opened the session by stating that the task of helping the colleges and universities to acquire much needed laboratory equipment and other training aids was one that could not be done in a hurry. "It is a five-year job," he said, "and in fact it will be an achievement if we can do it in that time."

Harvey T. Hill, DEMA's Executive Director, commented briefly on the one week course for mechanical engineering instructors which will be held at Cornell University beginning August 30.

George Amberg, Secretary of DEMA's Educational committee, stated that while most engineering schools of the country have enough diesel engines for laboratory instruction work, the schools sorely need equipment for proper instrumentation of those engines. Accessories are almost totally lacking, he declared.

DEMA's educational program was summarized by Mr. Hill in a talk he gave two days later at a luncheon held by the Oil and Gas Power Conference of the American Society of Mechical Engineers. Member companies of DEMA were represented by other speakers during the ASME conference, which commemorated the 50th anniversary of the American diesel. C. E. Beck of Nordberg Mfg. Co. reviewed "The Historical Development of the Modern Large Diesel in America." Ralph L. Boyer, of Cooper-Bessemer Corp., told of "the Present Status of the Large Diesel in America."

Fig. 1. Front view of the two-cylinder, 1200 bhp, experime Werkspoor-Lugt diesel.

Simplified Design for New Netherlands Diesel

Editor's Note: This article is reprinted from t January 1948 issue of our British contemporar "The Motor Ship." This Werkspoor-Lugt engi has attracted wide interest abroad as it has re interesting possibilities in ship installation. I many novel design features are worthy of note this country.

FOR a long time it has been thought that t next practical step in the development of the tw stroke single-acting engine would lie in the ado tion of supercharging and it is known that a goo deal of work has already been carried out in th field. In his new engine, G. J. Lugt, chief engine of Werkspoor, Amsterdam, has adopted this pri ciple, and has employed several other novel fe tures in design which it would appear have re sulted in a substantial reduction in weight, leng and height in comparison with any other slo running marine diesel engines now in comm use combined with a fuel consumption at norm load of under 160 grams or 0.35 lb. per bhp. hou a mechanical efficiency of 88 per cent, and a degr of accessibility and simplicity which should mak an appeal to those responsible for the operati of ships' machinery.

The particulars of weight and size which w were given are surprising. A six-cylinder 3,60 bhp. Werkspoor-Lugt engine (this is the design tion upon which the builders have decided), run ning at 125 rpm. with a bmep. of 7 kg. per sq. cm (100 lb. per sq. in.), weighs 135 tons or 84 lb. per bhp. compared with 315 tons for the standard pressure-charged four-stroke Werkspoor engine of the same power and speed. This latter is a type of which scores have been built, the fuel consump tion being about 10 per cent higher than that of the new design. It should be added that this low weight is not due to any reduction of scantlings and the engine is not "light" from this point of view. In fact the weight per litre cylinder capacity is quite equal to that of other engines.

A 4,800 bhp. Werkspoor-Lugt engine can be comfortably installed in the same size of engine-room as required for a four-stroke Werkspoor in-stallation of 3,600 bhp.

The production of the new engine has an inter-esting and unusual personal history. During the latter years of the war Werkspoor was unable to carry on its normal activity on account of lack of power and material, not to speak of objections to working at all for the Germans, and Mr. Lugt concentrated almost exclusively on a new engine which would embody those principles dictated by his experience as the responsible designer of Werkspoor marine diesel engines for a period extending over more than a quarter of a century.

When the war ended the design was complete

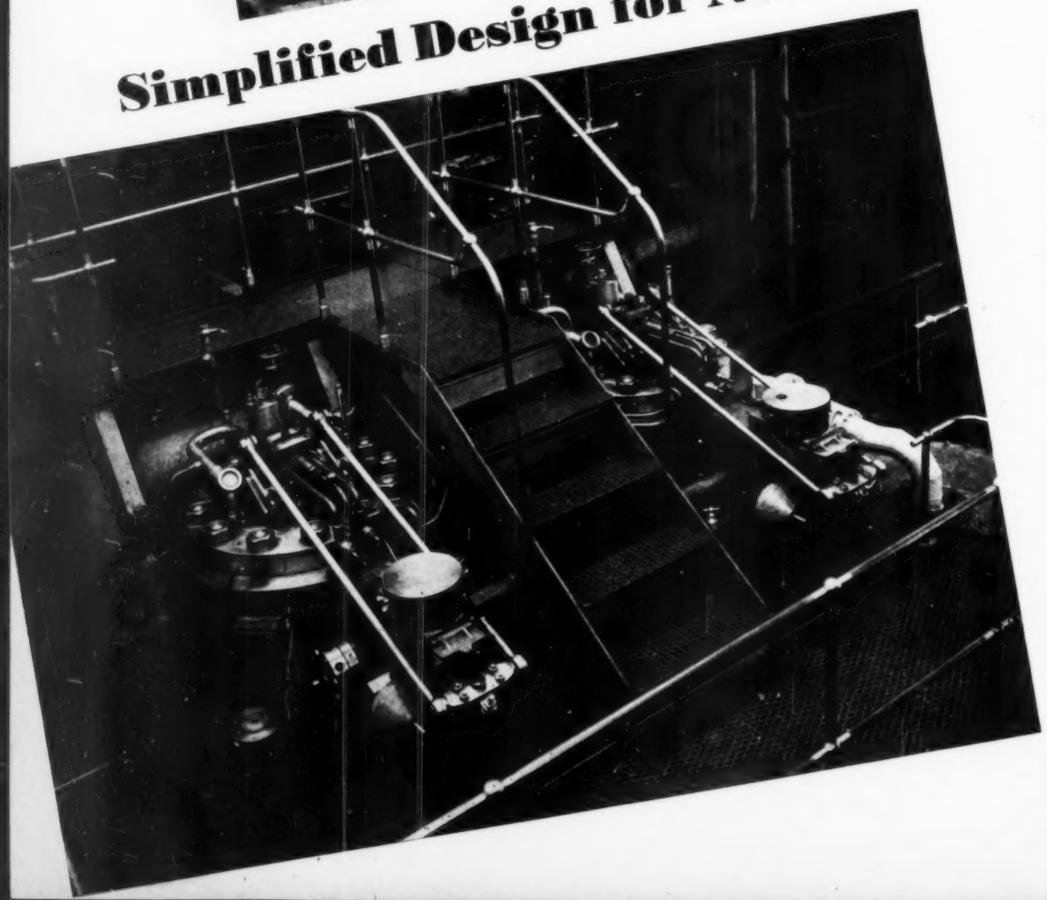


Fig. 2. The two pull rods for each cylinder, each rod operating two exhaust valves, are seen in this top view.

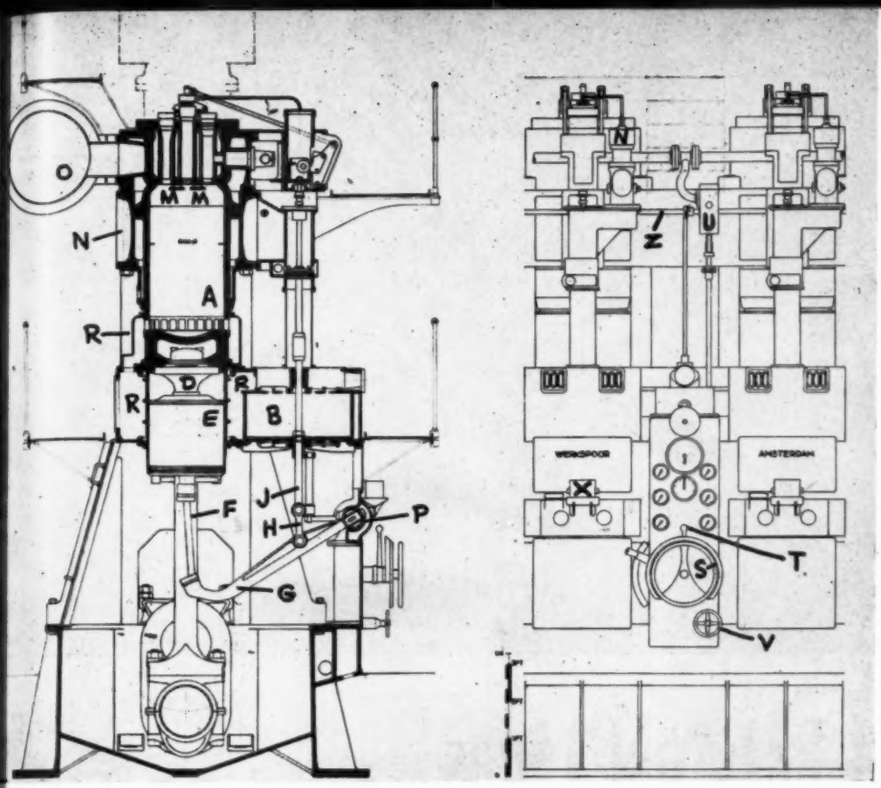


Fig. 3. Sectional end and side elevations of a two-cylinder Werkspoor-Lugt engine.

nd construction was at once commenced. It was ecided that the best plan would be to proceed ith the building of a two-cylinder experimental lant with cylinder dimensions equal to those hich would be employed in a standard produc- ion engine should the results prove satisfactory. n output (continuous rating) of 600 bhp. per linder was considered suitable so that a six- linder engine could be built of equal power to he present standard eight-cylinder Werkspoor our-stroke pressure-charged unit. It was found hat a cylinder diameter of 600 mm. with a piston troke of 1,100 mm. would meet the conditions ased on the bmep. which it was desired to each and on the anticipated mechanical effi- iency. Supercharging added 30 per cent to the utput compared with a non-supercharged unit, lthough this need not be considered as the maxi- um limit if it is wished to go further in this irection.

The two-cylinder 1,200 bhp. experimental en- ine, which is shown in Figs. 1 and 3, commenced rials more than a year ago and we saw it in opera- ion in 1946. Prolonged tests have been carried ut and various improvements have been made as result, and the stage has now been reached when he builders consider that this type of engine may e installed in ships with every confidence from he standpoint of reliability and economy of oper- tion. We inspected it under load on trials at the uilders' Amsterdam works last month and re- eived a highly favourable impression of its opera- ion.

Before describing the engine in detail it is to e remarked that the designer decided upon two ain principles of importance in connection with wo-stroke engines: that there should be a scav- nge pump for each cylinder and that the "straight- hrough" scavenge system should be adopted, with xhaust valves in the cover of the cylinder. The nteresting manner in which these principles were put into practice will be discussed later in the article, especially in connection with the working out of a third principle—that the complications of the reversing mechanism should be eliminated so far as possible.

Fig. 3 shows a sectional elevation and longitudinal elevation of the two-cylinder engine. The working cylinder is at A, C is the piston, D the piston rod, and E the crosshead, from which it will be observed that the engine is of what may be termed the low crosshead type. If built of the full crosshead design it is expected the weight will be increased by about 10 per cent and the height will be somewhat greater. The scavenge pump cylinder is at B, whilst J is the pump piston rod. It is driven by the links (F and H) and two levers (G), which are hollow.

One delivers the piston cooling lubricating oil to the piston head and the other is for its discharge. The fulcrums of these two levers are located at P; the system of levers forms a pantograph, so that the motion of the scavenge pump rod follows that of the working piston rod, and the indicator gear can, therefore, be arranged at the extension of the scavenge pump piston rod at the top of the engine.

The cylinder head is attached to the upper portion of the cylinder by means of studs (N). R is the scavenging trunk and O the exhaust manifold. There are four exhaust valves (M) per cylinder, symmetrically disposed around the centrally placed fuel injection valve and in this connection it is found that scavenge ports so shaped as to provide a direct right-angle entry of the air to the cylinder give the best combustion. No endeavour is made to shape them so as to give rise to a heavy swirling effect, which would be more advantageous when there are two injection valves—one on each side of a central exhaust valve.

The exhaust valves are operated in pairs by two rods (L) and a specially interesting gear has been devised for this motion at the top of the extension of the scavenge pump piston rod.

The air from the atmosphere is compressed in the pump to a pressure of 0.45 atmospheres, or, about 7 lb. per sq. in., and is delivered at this presure to the scavenging air receiver, into which the supercharging air is also discharged. This is obtained from an exhaust-gas-driven turbo-compressor; the exhaust gases from the working cylinder are taken directly to the turbine driving the compressor (at a speed of 13,000 rpm.) and the turbo-compressor may be placed at any convenient point in the engine-room—in a sound-proof compartment or in the funnel, if desired. All the gases pass through the turbine and an exhaust gas boiler can, of course, be arranged to utilize some of the exhaust gases for the production of steam. It is to be noted that the air from the turbo compressor may be cooled before it is supplied to the scavenging air receiver, the temperature level of the complete cycle being thereby lowered.

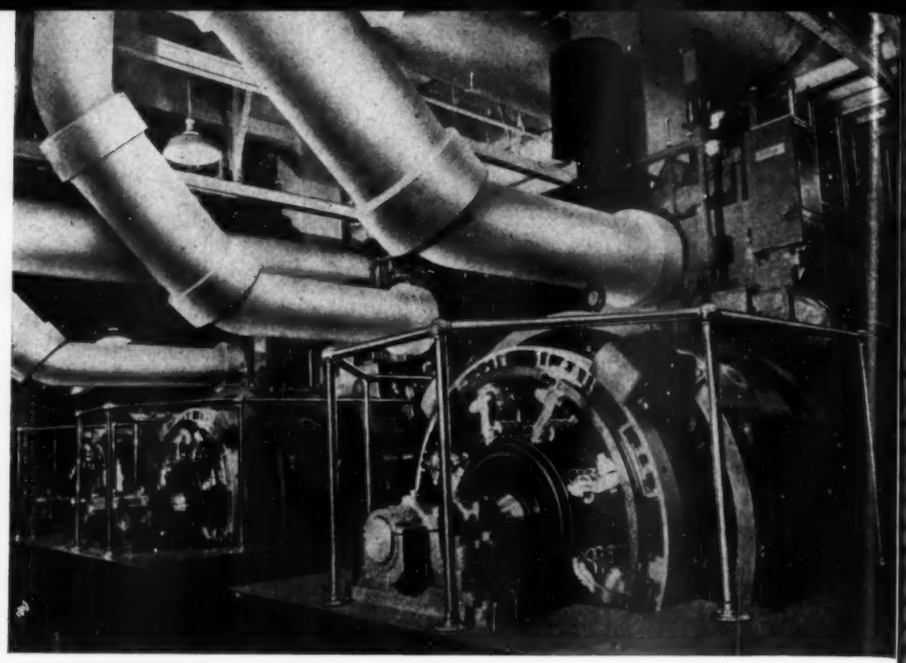
The main starting valve is at U, whilst the handwheel actuating this valve is seen at V. The fuel pump of one cylinder is shown at W; X is a cylinder lubricating pump and Z the governor shaft. There is a point in connection with the design of the turbo-blower which should be noted. With four-stroke exhaust-gas turbo-charged engines the weight of the exhaust gases passing through the turbine is equal to that of the air delivered by the compressor, apart from the negligible weight of fuel. In the case of this two-stroke engine the weight of the supercharging air required is only about one-third of the exhaust gases, and the compressor is designed accordingly. The pressure at which the gases reach the turbine is about 0.35 atmos., or 5 lb. per sq. in., and they are, of course, discharged at atmospheric pressure.

As the scavenge pump piston rod movement corresponds to that of the working piston, and the exhaust valves are actuated from the former, also the fuel pump, in reversing, it is merely necessary that the engine shall be started in the required direction. The only reversing mechanism needed is that for the starting pilot valves, which can be operated easily by hand.

At the controls is one small lever (T) for operating the telegraph and so locking the manoeuvring handwheel (S) that it can only be moved consistently with the telegraph orders. The first movement of the handwheel (right or left) allows air to be admitted to the cylinders. Further turning of the wheel brings the cylinders on fuel and the speed is controlled by continued movement of the wheel to the revolutions desired. There is a second lever which sets the governor to any desired maximum speed, whilst it can also cut off fuel and stop the engine in case of emergency.

With the arrangement thus described, each engine, apart from bedplate and crankshaft, is completely self-contained with its own scavenge pump and fuel pump, and the cylinders can thus be manufactured in series and the engines built up from whatever number of standard cylinders may be needed for the requisite power.

The system which has been utilized by Werkspoor for many years for removing the piston is employed in this engine. There is a loose extension piece bolted to the bottom of the cylinder, and if this is lowered the piston rings can be inspected and, if necessary, replaced.



Diesel installation at No. 2 Park Ave., New York equipped with silica-magnesia jacketed exhaust line.

Insulation of Diesel Exhaust Lines

By EDGAR J. KATES*

three and one-half inch silica-magnesia jacket reduces surface temperatures to 125° f

IMPORTANT factors in the successful operation of the diesel-electric plant at No. 2 Park Avenue, a 28-story office building in New York City, are the materials and methods used for insulating the diesel-engine silencers and exhaust piping. In contrast with steam-electric power plants, where heat in the form of high temperature steam is the main energy source, heat in this plant, in the form of high temperature exhaust gases, is a waste product because its utilization is impracticable. As a consequence, the function of the insulation here is quite different from that in a steam plant, where insulation is used to reduce heat losses and thereby increase plant efficiency. At 2 Park Avenue the function of insulation is to keep the engine room temperature at a comfortable level and, at the same time, to protect the men from being burned by the hot equipment.

Without adequate insulation, the ambient air temperature would be so high as to make it virtually impossible to work in the engine room. Enough heat would be given off by the large surface area of the equipment and piping to raise the engine room temperature to 150° F., or even higher. Furthermore, because of the compact layout of equipment, it would be difficult for the men to operate and maintain the plant without being burned by a hot surface.

There are five diesel generator sets at 2 Park Avenue in an area of about 1500 sq. ft., with a ceiling height of about 17 ft. Four of the units, each consisting of a 450 hp. Worthington diesel directly connected to a 300 kw. Crocker-Wheeler generator, were installed in 1936. The fifth unit, installed in 1947, has the same physical dimensions as the other units, but, because of higher speed and turbo-charging, the engine is rated at 740 hp. and drives a 500 kw. generator.

Exhaust gases leave each of the four old engines through a 10 in. line running diagonally up into the Maxim silencer overhead, which leads back along the length of the engine. Each silencer is 24 in. in diameter and about 18 ft. long. The exhaust line leaves the silencer, turns at right angles, and passes through a Maxim pulsation trap, 35 ft. long and about 24 in. in diameter. The layout of the exhaust system of the new unit is similar except that a 14 in. line is used and the pulsation trap is omitted. Because of the larger capacity of the unit, the silencer is 42 in. in diameter and 21 ft. long. All five exhaust lines join into a 24 in. main that runs parallel to the engines and connects with a flue.

To avoid the possibility of vibration transmission, each exhaust line is connected to the engine by means of a flexible metal hose about 5 ft. long and of the same diameter as the exhaust piping.

Operation schedules call for the start-up and shut-down of every engine within a 24-hour period. Exhaust gas temperatures, which vary with the load carried by the particular engine, average around 650-700° F. for the new engine and somewhat higher for the old engines.

The materials and methods used for insulating the new diesel engine are typical of the entire plant and the description will therefore be limited to that unit.

All equipment and piping through which the exhaust gases pass are covered with a combination insulation consisting of an inner layer of diatomaceous silica and an outer layer of 85% Magnesia.

Both materials are molded products that are available in blocks, semi-cylindrical and segmental pipe sections, and other shapes useful in industry. 85% Magnesia is a mixture consisting of 85% magnesium carbonate and asbestos fiber. Diatomaceous silica is a naturally occurring material consisting of tiny fossilized plants called diatoms, to which asbestos fiber is added. In both cases the asbestos fiber provides the necessary binding and reinforcing qualities so that the materials can be molded.

85% Magnesia is used on equipment operating at temperatures below 600° F. By using it in combination with the diatomaceous silica, which is used for temperatures above 600° F., advantage is taken of the resistance to high temperatures of the latter and of the low heat conductivity of the magnesia.

When subjected to alternate heating and cooling, this combination insulation does not crack, loosen, spall or become damaged in any way that would decrease its insulating efficiency. This property is of paramount importance since the operating schedule results in the insulation being alternately heated up to the exhaust gas temperature and cooled to the room temperature.

When the insulation thicknesses for the new unit were specified, two considerations were kept in mind. First, the surface temperature of the inner layer of diatomaceous silica was not to exceed 600° F. Secondly, the surface temperature of the outer layer of 85% Magnesia was not to exceed 160° F. A maximum design temperature difference of 1000° F. between exhaust gas and ambient air was used as a base. Taking into consideration the diameter of the equipment to be covered, it was determined that a 2 in. thick layer of diatomaceous silica and a 1½ in. thick layer of 85% Magnesia would meet the requirements. With these thicknesses the surface temperature of the inner layer would not exceed 580° F. and the surface temperature of the outer layer would not exceed 157° F., should the exhaust gas-ambient air

* *Consulting Engineer*

mperature difference be 1000° F. Actually, the rface temperature of the insulation averages ound 125° F. because, in operation, the exhaust s temperature is lower than the maximum design mperature.

Before the insulation was applied, the exhaust e and silencer were wiped clean of any dirt or bris that might prevent a snug fit of the insula- n against the equipment surface. The inner yer of diatomaceous silica was wired on with the gments butted tightly together, and the longi- dinal joints staggered. The 85% Magnesia layer as applied in the same way except that on the lencer it was banded on instead of wired on. are was taken to stagger the joints in the mag- sia layer with those in the diatomaceous silica yer. Joints in both the inner and outer layers ere sealed with cement of the same material as e insulation. The cement on the inner layer was lowed to dry before the outer layer of insulation as applied so that no checks or cracks would velop. Staggering and sealing of joints is an important aid in preventing the escape of heat.

Insulation near flanges was beveled off so that nuts and bolts could be easily removed; without damage to the adjacent insulation.

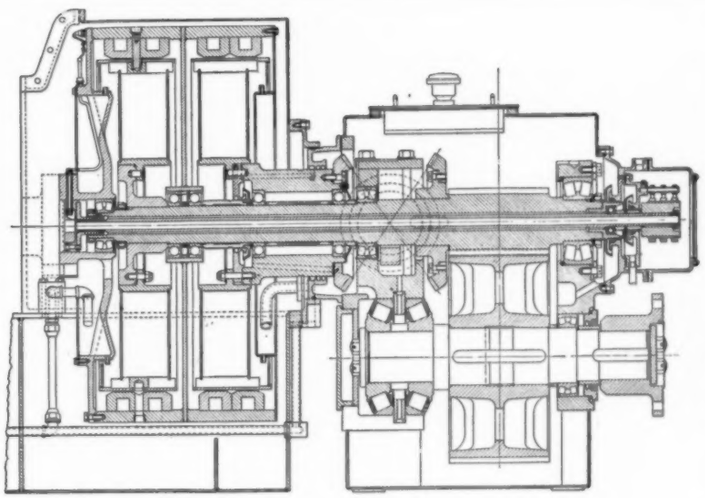
The flexible hose connection presented a special problem. The insulation had to be applied in such a way that it would not get into the crevices between the corrugations of the flexible hose. Also the hose surface had to be kept from rubbing against the surface of the insulation as the hose expanded and contracted. To accomplish these two things, a ½ in. wire mesh was wrapped around the hose before the insulation was applied and the insulation was wired on over the mesh jacket.

As further protection for the insulation on the flexible hose, the insulation was stopped about 2 in. from the flange at either end of the hose. The space between was filled by a 1 in. thick asbestos rope wrapped around the hose to a thickness equal to that of the adjacent insulation. The asbestos rope acts as a 'cushion" for the insulation as the hose expands and contracts.

Flanges were insulated with block insulation cut to fit the contour of the surface. All crevices, joints, pockets, voids, etc., in the insulation were sealed with cement made of the same material as the insulation. Flange insulation was extended over the adjacent pipe insulation for a distance of 2 or 3 in., and the joints between the pipe and flange insulation were sealed in the same way as other joints and cracks.

Instead of the more usual canvas finish, as an extra precaution to avoid any possible fire hazard, the pipe insulation was jacketed with asbestos cloth sewed on with asbestos twine. Should hot gases escape accidentally from a faulty flange or fitting, the presence of oil on the lines, as may be expected in the engine room where oil and oil-soaked waste are present, might result in a fire if a canvas finish were used. Because of the large diameter of the silencer, the use of an asbestos cloth jacket was impractical, and it was therefore given a hard cement finish.

ELECTRICAL MARINE REVERSING GEAR



Sectional view of Gehres drive.

A REVERSE-REDUCTION gear for marine ervice which provides vessel performance heretoore attained only by diesel-electric propulsion, but ith simplicity and economy comparable to direct rive, has been announced by the Cooper-Bessemer orporation. The unit has been named the "Gehres Drive" by Cooper-Bessemer, in honor of ewitt A. Gehres, the company's executive vice resident and director of engineering, who conceived the design and supervised its development. The Gehres Drive consists of two simple, rugged ddy current slip couplings connected to sturdy, ompact reverse-reduction gears. The only elecrical equipment required besides the couplings s one generator of 3 to 5 KW capacity for excitaion, and three slip rings.

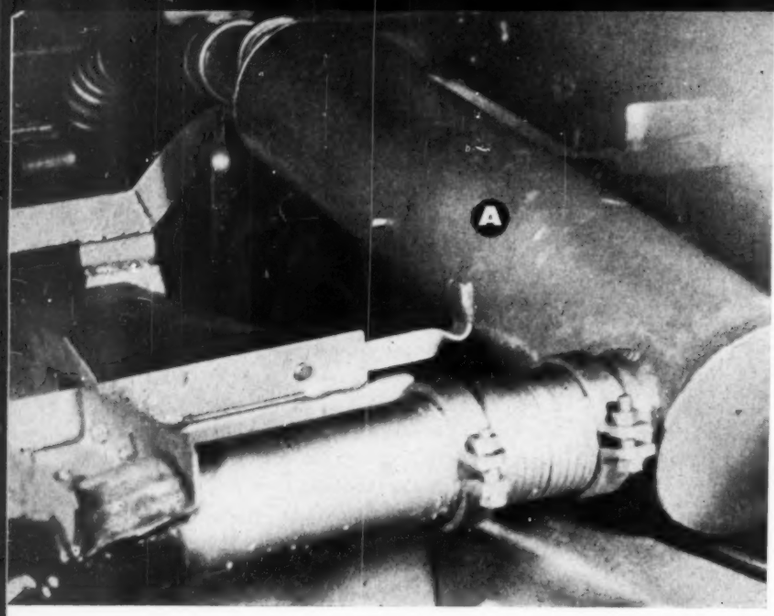
From the standpoint of vessel performance, the ehres Drive combines extreme simplicity of pilot ouse control with flexibility of propeller speed qual to electric drive. This flexibility is attained y variation of engine speed and coupling excitaion. Throughout the greater part of the range, the engine rpm are varied, whereas for extremely low speeds the coupling current determines the coupling slip and, therefore, the propeller rpm. Furthermore, because the transmission does not involve clutches or any mechanical contacts, full reversal of the propeller shaft can be accomplished with no reduction in engine speed. This, of course, permits faster reversing.

During a recent demonstration staged on the Mississippi River by the Calmes Engineering Company, of New Orleans, the Gehres Drive enabled a tugboat operating at full speed ahead to come to a full stop within its own length. It took ten seconds to reverse the shaft from full speed ahead to full speed reverse, according to official observers. Improved designs now in production will considerably reduce this figure.

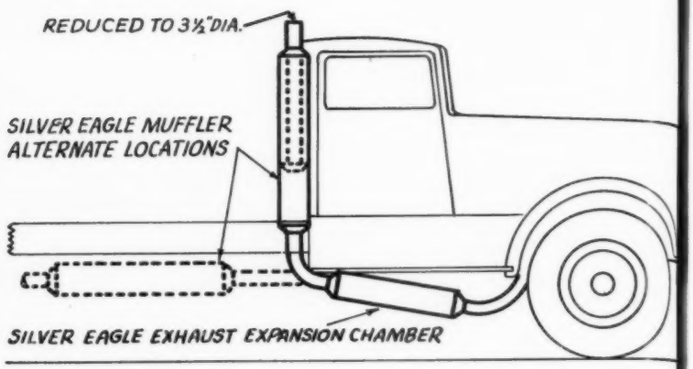
Another important advantage in the use of the eddy current coupling is the complete isolation of torsional vibrations between the engine on the one side, and the gears, shafting and propeller on the other. Furthermore, this torsionally flexible transmission minimizes damage in the event of sudden shock to the propeller from logs or other underwater obstructions or from running aground. Any such shock causes greater slippage in the coupling, the increased heat from which is dissipated by the cooling oil.

As stated before, all of the above advantages are rivaled only by the electric drive, whereas the first cost, operating efficiency, simplicity of installation and maintenance, weight and space occupied by the Gehres Drive are superior. As compared with direct or geared drives previously available, the Gehres Drive is superior in maneuverability, speed control and torsional isolation. It is, however, comparable in first cost, ease of installation, and simplicity.

In the Gehres Drive the engine, coupling and gears are all enclosed in one housing, requiring only one shaft opening. As compared with individual units, this reduces the number of shaft openings from five to two, thus eliminating four potential oil leaks and points of entry for dirt.



(Left) Exhaust receiving chamber (A) reduces engine noise level by reducing speed of exhaust impulses.

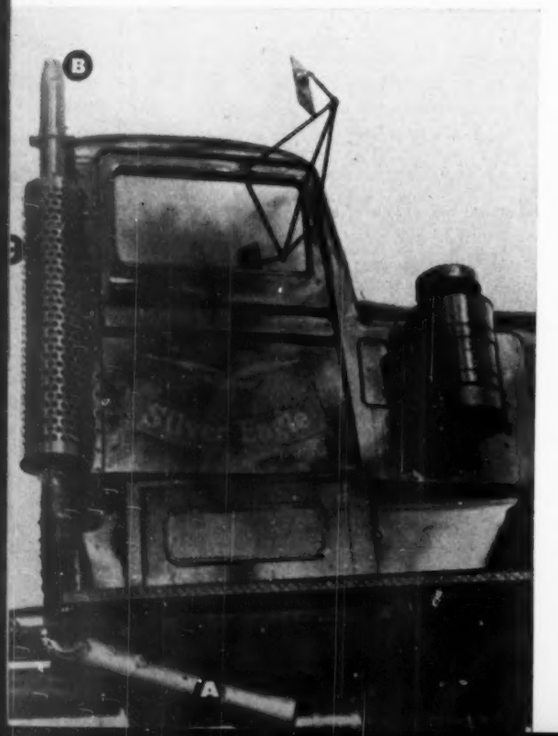


(Above) Installation sketch of new type muffler mounted on diesel truck.

New Silencing Device for Diesel Trucks Reduces Smoke

By W. J. GRANBERG

Exhaust line installation shows new exhaust receiving chamber (A) and reduction of tail pipe at (B). No change was made in conventional muffler (C).



MARKING the culmination of years of research by the Oregon Motor Transport Association, Inc., an exhaust receiving chamber has been developed by the equipment and maintenance committee which successfully reduced the noise level of diesel trucks. A by-product of the association's study is an alteration in the tail pipe size which reduces the smoke and odor nuisance.

Julius Gaussoin, chairman of the association's committee and president of Silver Eagle Company, Portland, Ore., haulers of bulk petroleum products and manufacturer of truck and trailer equipment, declares that the new device, which is nothing more than an expansion chamber set in the exhaust pipe line between motor and muffler, permits operation at maximum horsepower while reducing the noise level. He points out that while it has long been possible to so restrict exhaust flow that noises were held at a reasonable limit, noise was nearly continuous when engines were pulling heavy loads under full throttle and maximum horsepower.

Gaussoin and his committee developed the exhaust receiving chamber from the thought that speeds of gases entering the exhaust manifold approximated 1,200 miles per hour and that if any exhaust impulses reached the end of the exhaust pipe at this supersonic speed level there would be "thunder" at the end of the pipe. They believed "cracking" started at 1600 rpm. of the engine and continued up to the governor limit. The conclusion was that the speed of exhaust impulses has more to do with producing noise when the engine is pulling hard than does the actual discharge, for the engines under study produced their maximum torque at between 800 and 1200 rpm. It was decided that if a steady flow out of the exhaust pipe was maintained, a pipe of only three inches in diameter would be needed to reduce the speed of impulses to approximately 200 miles per hour, and thus eliminate "cracking."

Said Gaussoin: "The theory that we are cracking the atmosphere and having thunder at the end of the tail pipe may not be correct, but the gadget does work and the back pressure is unbelievably low. In one test, a straight pipe had higher back pressure than this modified exhaust system."

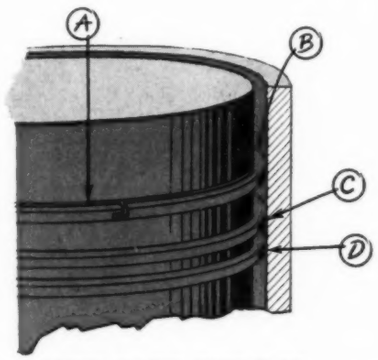
The exhaust receiving and expansion device is a metal chamber 36 inches long and eight inches in diameter which is inserted in the exhaust pipe between engine and muffler. It reduces engine noise simply by modifying exhaust charge before they pass into the muffler through slowing the maximum speed of the impulses. No alteration was made in the muffler itself and the receiving chamber may be installed in the line of any conventional exhaust system.

Mr. Gaussoin says that the device has been installed on 20 trucks under supervision of the association's committee, "with excellent results." He added that it was almost impossible to hear the engines accelerate during gear shifts, and that no flame and very little smoke was emitted by the exhaust pipes.

Research by the committee of the Oregon association resulted also in reducing the amount of smoke which had been marking operation of the heavy trucks. This was accomplished by reducing the size of the tail pipe and kicking the smoke higher into the air. This reduction of the tail pipe had not been possible before the new receiving chamber was developed for the reason that a steady flowout of the smaller pipe caused high back pressure.

Reducing the size of the tail pipe was accomplished by cutting a gusset out of the end of the four-inch pipe for a distance of four inches, reducing the four-inch end of the pipe to a diameter of three and one-half inches. The result is that exhaust is shot higher into the air and better dissipated. Cautious in his claims for this device, Gaussoin adds: "It may well be that the device actually does reduce smoking" (in itself and not through dissipation alone).

CASE D119A--MAINTAINING FULL POWER IN DIESEL ENGINES.



SECTION OF DIESEL ENGINE PISTON

Operators of Diesels in all types of service report RPM DELO Diesel Engine Lubricating Oil materially reduces power loss in three ways:

A. Detergent compounds prevent ring-sticking, allow full ring tension against cylinder wall, and this minimizes compression loss.

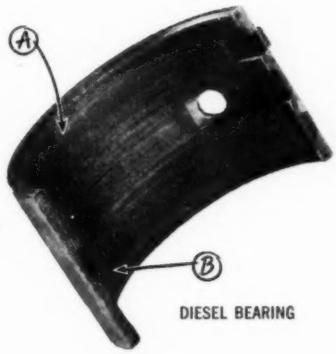
B. Metal-adhesion additive keeps full oil film on hot upper cylinder walls. These danger areas are often left unprotected by many oils.

C. RPM DELO Oil maintains a tough oil seal that stops blow-by of combustion gases.

D. An anti-oxidant increases the inherent stability of RPM DELO Oil's selected base stocks and resists lacquer formations on liners and piston skirts.

Other additives in this pioneer compounded oil prevent foaming, and control gum formations.

CASE D119B--PREVENTING FREQUENT BEARING REPLACEMENT DUE TO CORROSION.



DIESEL BEARING

In normal operation, Diesel engines require excess oxygen and operate at high temperatures. Under these conditions many unstable lubricants tend to turn corrosive and attack the lead in the copper-lead structure of alloy bearings. RPM DELO Diesel Engine Lubricating Oil is especially compounded to prevent this cause of bearing failure.

A. Selected base stocks are used that are naturally resistant to oxidation, the cause of most bearing corrosion.

B. Anti-oxidation compounds in RPM DELO Oil further reduce the danger of corrosion.

In laboratory corrosion tests, copper-lead bearing strips immersed in RPM DELO Diesel Engine Lubricating Oil showed considerably less weight loss than those protected by similar type oils.

For additional information and the name of your nearest Distributor, write

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Diesel Engine Developments In Europe

A Novel Type of Vibration Damper of Geiger

By KALMAN J. DEJUHASZ*

RECENTLY information has been received on a torsional vibration damper of novel type which will be of interest for diesel engine designers and users in this country.

This is an inertia-type vibration damper, designed by Dr.-Ing. Joseph Geiger, the well known expert on vibration phenomena and the inventor of the Torsiograph and Vibrograph bearing his name. The following description is based on the information received from Dr. Geiger.

This damper contains no springs, nor frictional, damping or other energy-dissipating devices. Its function is based solely on inertia, the excess energy being stored in the form of potential energy in a centrifugal field, and any deficiency of energy being supplied from the energy thus stored. In this respect it belongs to the class of the pendulum but an unbalanced rotor serves as the energy storer element.

The device is illustrated schematically in Fig. 1 in which W is the end of the engine shaft on which a hub N is keyed, in which latter the two eccentric masses are rotatably mounted on shafts A; the extension of this latter shaft A is formed as a gear Z_1, being a planet gear which engages with another, stationary, gear Z_2, a sun gear, fastened to the engine housing. Thus, when the shaft W and hub N rotates the two planet wheels Z_1 will roll on the stationary sun wheel Z_2, and the two eccentric masses will rotate together with them, according to the gear ratio $U = \frac{Z_2}{Z_1}$. This gear ratio is chosen equal to the order of harmonic which is to be damped out, in the illustrated case the 4-th order $U = \frac{4}{1}$. It can be readily visualized that when the shaft W and hub N rotate the unbalanced torque exerted by the two eccentric masses will tend alternately to accelerate and decelerate the shaft rotation, and, if the masses, their eccentricities, and their phase relationship to the exciting torque are suitably chosen, it will tend to counteract, or even cancel the torque fluctuations produced by the exciting forces. This function will be more clearly explained by the following simple dynamic analysis.

Denoting: $\omega = \frac{n\pi}{30}$ = angular velocity of shaft W and hub N,
m = eccentric mass,
R = radial distance of shaft of eccentric mass from axis of W,
r = eccentricity of the eccentric mass m,
U = gear ratio $= \frac{Z_2}{Z_1}$,
ω_0 = angular velocity of eccentric mass $= \omega U$,

then the centrifugal force exerted by the eccentric mass m, in virtue of its rotation about its own axis will be:

$$C_1 = m\omega_0^2 r = m\omega^2 U^2 r,$$

and the maximum torque exerted on the shaft W by the two eccentric masses will be:

$$M_1 = 2m\omega^2 U^2 r\, R$$

The value of the torque will vary sinusoidally, U-times per crankshaft revolution, between the extreme values $+M_1$, and $-M_1$.

By the motion of the eccentric mass relatively to the rotating shaft W also a Coriolis force is produced the value of which is:

$$C_2 = 2m\omega_0\omega r = 2m\omega^2 Ur$$

which acts in the same direction as the C_1, centrifugal force.

The maximum torque produced by the Coriolis force is:

$$M_2 = 2 \cdot 2m\omega^2 UrR$$

which also varies sinusoidally between $+M_2$ and $-M_2$ values, its value being zero in the innermost and outermost positions of the eccentric rotor.

The sum of the two torques is:

$$M = M_1 + M_2 = 2m\omega^2 U\,(U+2)r.\,R$$

Our purpose is now, to choose the variables m, U, r and R in this expression in such a manner that the torque will neutralize the harmonic torque of a given order in a multi cylinder engine. This is accomplished if the work of the torque M is equal to the sum of the work of the harmonic forces acting on the several cranks. Denoting:

F = piston area,
Δp = the exciting harmonic pressure in the individual cylinders, as determined from the tangential force diagram, minus the frictional unit force.
R_K = crank radius,
$a_1, a_2, \ldots a_n$ = the angular amplitude of the individual cranks in their free vibration,
a_A = angular amplitude of the vibration damper,

it can be written:

$$\Delta p\, F\,(a_1 + a_2 + \ldots + a_n)\, R_K = 2\, m\omega^2 U\,(U+2) r\, R\, a_A$$

Strictly speaking, a complete cancellation of the vibration can be achieved only at a certain engine speed, that is, the critical speed for which the damper is designed, and for which the above equation holds good. The inertia force of the damper, however, varies in proportion with the square of the speed, while, in general, the exciting torque varies in accordance with some other relationship (only in the cases of ship propellers does the torque change in proportion with the square of speed). Fig. 3 shows the interrelationship between the engine load (IMEP) and the exciting unit force for vibrations of the 4-th and 4.5-th order. Therefore, at other than the designed speed, there remains an uncancelled residue between excitation

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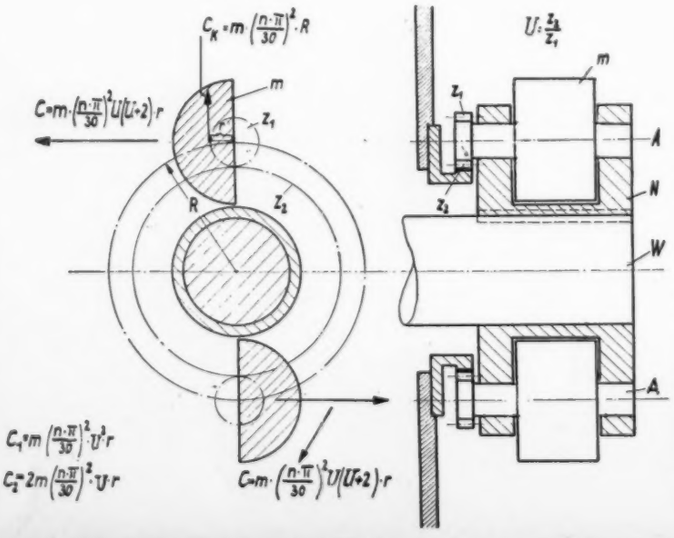


Fig. 1 left, Schematic arrangement of the Rotor Damper of Geiger, showing eccentric masses rotated by means of planet and sun gearing.

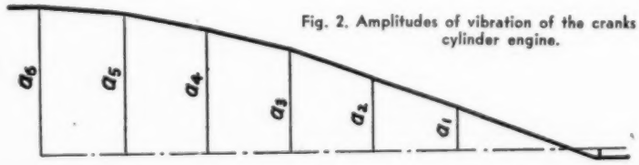


Fig. 2. Amplitudes of vibration of the cranks of a six-cylinder engine.

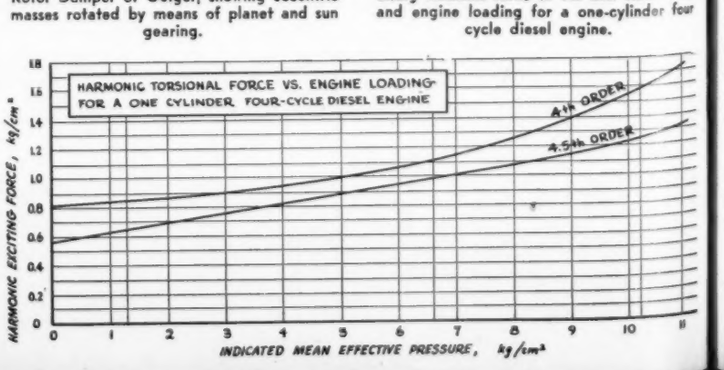


Fig. 3. Interrelation between harmonic exciting torsional force of 4th and 4.5th order and engine loading for a one-cylinder four cycle diesel engine.

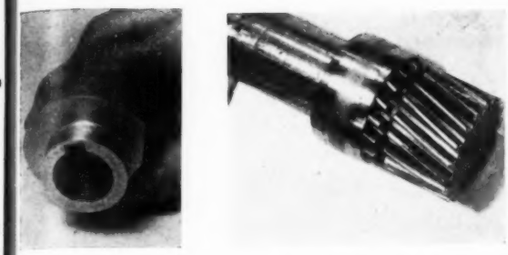


Fig. 5, left, eccentric rotor; right, rotor shaft and gear.

and counter excitation, but this residue is significant only in a range removed from the critical speed, in which the torsional vibration is of little importance and danger. It can occur, however, in special and rare cases, that in the system there exist two widely separated critical speeds produced by vibrations of the same order. In such cases a complete cancellation is impossible and a compromise must be resorted to, either by eliminating fully one of the two criticals, or to mitigate both to a certain extent.

At this place it may be useful to make some explanations regarding the stress conditions of the shaft of a multi cylinder engine fitted with a torsional vibration damper, such as the 5-cylinder engine shown in Fig. 4. At one end of the shaft there is mounted an electric generator, at the other end the vibration damper. The exciting torques act at the individual cranks, while the counter excitation produced by the vibration damper acts at the free end of the crankshaft. Thus the shaft adjoining the generator is loaded by the sum of all the mean torques of the preceding cranks but it is free of the exciting torques of the order for which the damper is designed. Proceeding toward the left, the shaft portion between cranks I and II is loaded with the sum of a lesser number of mean torques, but it is loaded also by some uncancelled counter exciting torque produced by the damper. Finally, the shaft position between crank V and the vibration damper is subjected to no load from the mean torque, but is subjected to the total of the counter-exciting torques produced by the damper.

The device was described as consisting of two eccentric masses arranged at 180 degs. from one another. But it will be readily realized that instead of two eccentric masses, any larger numbers may be used, evenly distributed about the hub N, whereby space may be saved, which is of particular advantage whenever large exciting harmonics are to be compensated. It is also possible to balance two or more critical vibrations of different orders. by using a pair of oppositely arranged eccentric masses for each order of vibrations, each pair having the proper gear ratio relative to the crankshaft. In most such cases it is possible to arrive at a satisfactory design solution by using only one large sunwheel Z_2, and using differing planet gears Z_1, for each pair of eccentric masses. For example, for eliminating vibrations of the 4-th and 4.5-th order it is possible to use one sungear of 72 teeth and planet gears of 18, and 16 teeth respectively.

Fig. 5 a shows the eccentric weight and Fig. 5 b the shaft with the planet gear which is of the helical tooth type. Fig. 6 shows the damper at the front end of a 9-cylinder engine.

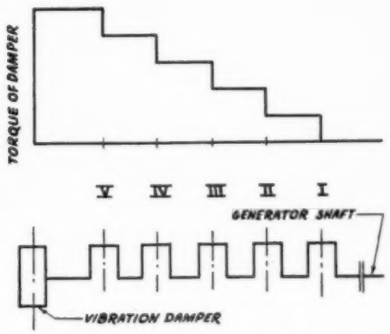


Fig. 4. Torque produced by damper in successive shaft elements of a five-cylinder engine.

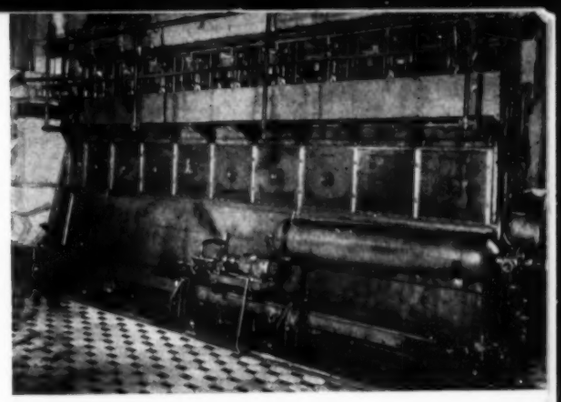
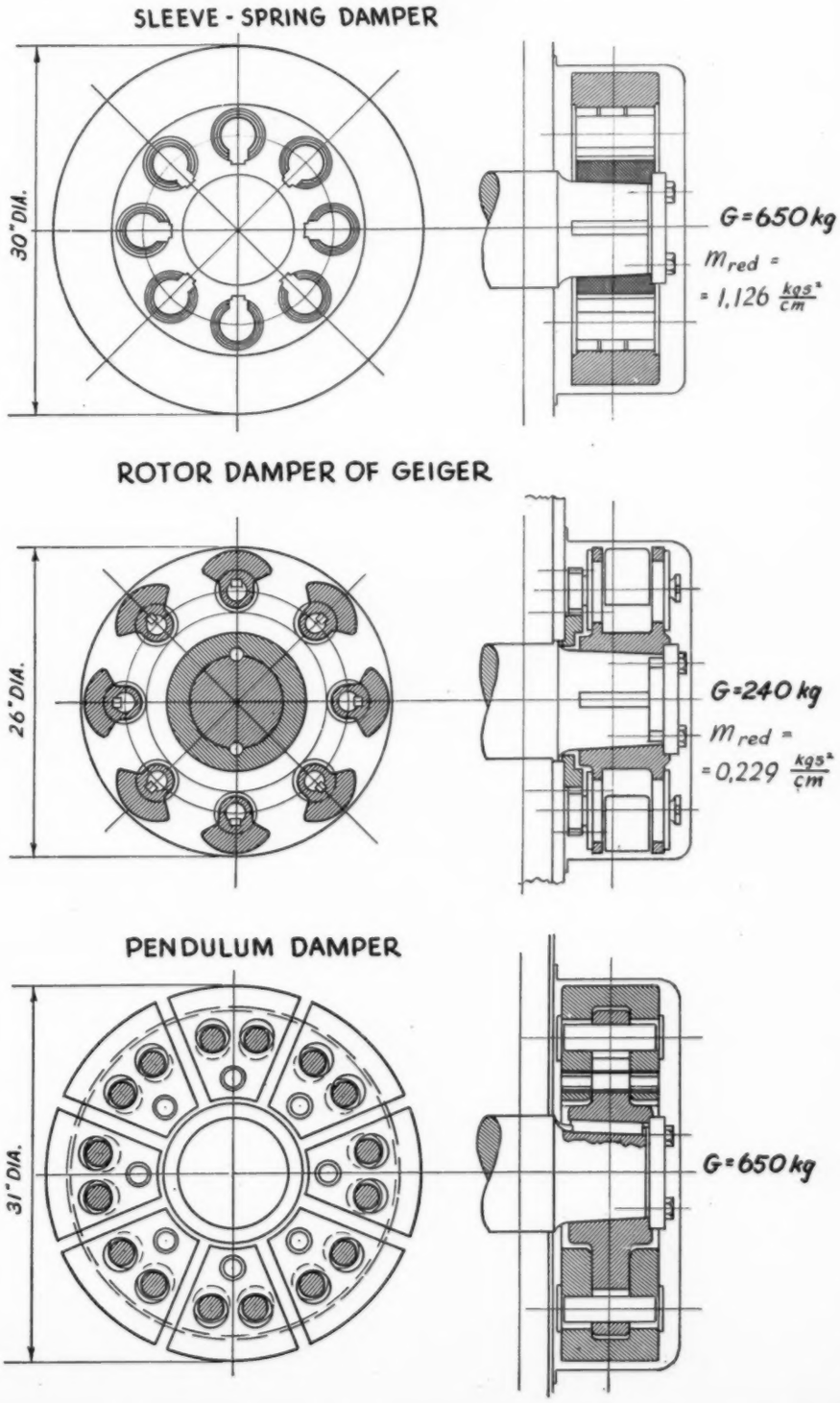


Fig. 6. Rotor damper of Geiger mounted on a 9-cylinder diesel engine.

Fig. 7. Comparison of weight and dimensions between a sleeve-spring type, rotor-type and pendulum-type damper.



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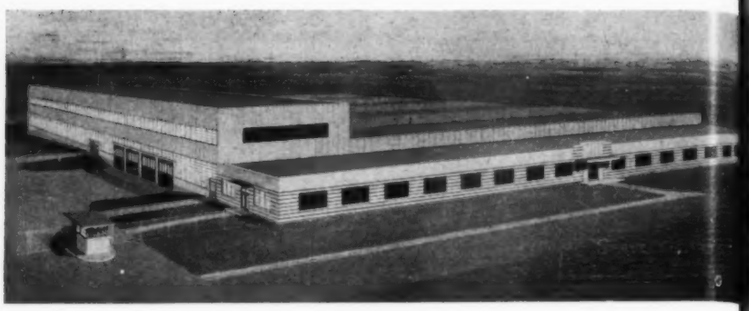


From Top to Bottom: R. M. Dilworth, Engineering Assistant to Vice President; L. F. Campbell, Executive Engineer; and E. W. Kettering, Chief Engineer — all of Electromotive Division of General Motors Corporation.

New Parts Department Building Planned

PLANS for construction of a new Parts Department Building at the LaGrange Plant of Electro-Motive Division which will provide largely increased capacity for the handling of parts for General Motors diesel locomotives are announced by C. R. Osborn, Vice President of General Motors and General Manager of Electro-Motive Division.

The Parts headquarters will be the 68th building project to be constructed by Electro-Motive on a site that only 13 years ago was a farm. With the addition, Electro-Motive will have 62 acres of space under roof devoted exclusively to the manufacture of diesel locomotives. Currently, an average of five locomotive units are completed each working day at the plant.

To be an one-story building, the Parts structure will cover 150,000 square feet of floor space. Contract for the steel has been let and the laying of the foundation will begin in June. Steel structure will follow in September and completion is expected in December.

The present Parts Department space of 75,000 square feet in the main plant at LaGrange will be replaced by the new facilities. Another Parts warehouse of 115,000 square feet at Argo, Illinois will continue in operation. Electro-Motive also maintains parts warehouses at Halethorpe, Maryland; Jacksonville, Florida; St. Louis, Missouri; Minneapolis, Minnesota; and Emeryville and Los Angeles, California, serving the country's railroads at important concentration points.

Construction of the larger facilities is made necessary by the large increase in the replacement parts business which has followed the rapid growth of the use of General Motors locomotives. In a twelve-year period, more than 5,000,000 horsepower in diesel locomotive units manufactured at the LaGrange plant have gone into service on American railroads.

Dilworth Heads New Engineering Activity

EXPANSION of engineering activities of Electro-Motive Division to keep pace with the growth of the business has been announced by C. R. Osborn, Vice President of General Motors and General Manager of the Division at LaGrange, Illinois. The expansion includes the creation of a new separate engineering activity headed by R. M. Dilworth, Chief Engineer since 1926. Mr. Dilworth was appointed Engineering Assistant to Vice President. E. W. Kettering, former Assistant Chief Engineer, was appointed Chief Engineer. L. F. Campbell, former Chief Production Engineer, was appointed Executive Engineer.

Mr. Dilworth, reporting to the General Manager, will be in direct charge of important advance engineering projects falling outside the usual scope of the normal engineering activities. The Engineering Department, under full charge of Mr. Kettering, also reporting to the General Manager, will carry on the normal product development programs as it has in the past.

"Creation of the separate activity headed by Mr. Dilworth is in line with the predominant engineering character of Electro-Motive since its founding in 1922," Mr. Osborn explained. "We have always followed a pattern of development based upon carefully determined facts.

"The research laboratories develop new basic information in physics, chemistry and other branches of science. The advance engineers determine whether this new information makes possible the creation of new products or radical improvement of old products. Final application of this finely sifted information into the products currently offered for sale is the job of the regular Engineering Department.

"We have had advance engineering within our Engineering Department from the start. But the work that must be done, if the possibilities in some of the new fields opened up since the war are to be realized in locomotive development, is so great that it requires the undivided attention of a staff remote from the pressing immediate problems of current commercial product development.

"It was logical that we should call upon Mr. Dilworth, the dean of American motive power development engineers, to head the new activity."

USEFUL POWER FACTOR CALCULATING CHART

By GLENN STANGLAND

WHAT will be the new power factor of your plant when you add another motor?

Knowing any two of the four variables KW, KVA, KVAR and PF for both original load and added load, you can find final PF by using the diagram this way:

Example 1

A plant carries 790 KW at 1000 KVA. *Working in the Plant quadrant, mark point A at the intersection of a vertical from 7.9 on the Original Load KW scale with the 10 Load KVA circle.* The synchronous motor to be added is rated 0.8 PF, 90% efficiency, 300 HP (250 KW). *Working in the Synchronous Motor quadrant, mark point B at the intersection of a vertical from 2.5 on the Added Load KW scale with the 0.8 PF radial line.* What will be final power factor of the plant? *Draw the dashed line from A to B; parallel to it, and through the bullseye, draw the other dashed line to solve for 0.92 lagging as final value of Plant power factor.*

Or you can find what the power factor of the added load must be, in order to raise Plant PF to the desired value, like this:

Example 2

A plant carries 790 KW at 1000 KVA. *Working in the Plant quadrant, mark point A at the intersection of a vertical from 7.9 on the Original Load KW scale with the 10 Load KVA circle.* Final power factor of the plant is to be 0.92. *Working in the Plant quadrant, draw the dashed line through the bullseye and 0.92 PF.* What must be the PF of a 300 HP, 90% efficiency synchronous motor? *Parallel with the first dashed line, and through point A, draw another dashed line; where it intersects a vertical from 2.5 Added Load KW in the Synchronous Motor quadrant, mark point B; a radial through B solves for 0.8 PF leading as the required power factor rating of the new motor.*

Other Values

Note in both examples that point A shows original Plant KVAR to be 615 (lagging) and that a radial through point A shows original Plant PF to be 0.79 (lagging). Likewise, point B has the four characteristics KW, KVA, KVAR and PF, any two of which will locate the point.

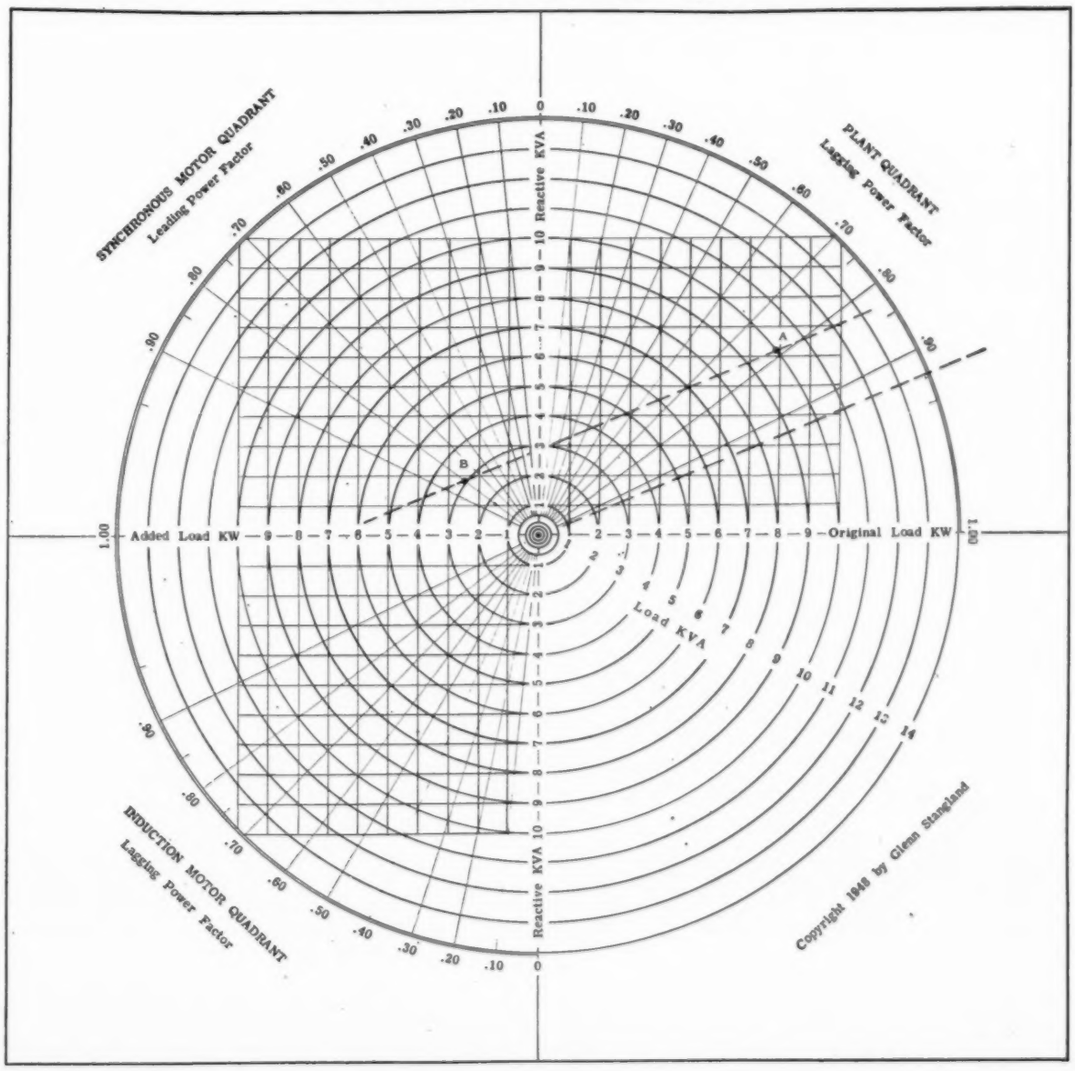
Other Loads

When the added load has lagging power factor, work in the Induction Motor quadrant.

When the added load is a capacitor, work along the upper Reactive KVA scale.

When the added load is pure resistance, work along the left-hand KW scale.

POWER FACTOR IMPROVEMENT NOMOGRAM



DIRECT

DIESEL POWER

Here's an excellent example from Milwaukee of direct application of an International, money-making Diesel power unit in an industrial shop.

It's an International UD-6, 4-cylinder Diesel, belt-connected to the drive shaft of a Cincinnati planer. Because of its inherent operating economy and long-lived dependability, this 39-horsepower International makes extra profits for its owners.

Instant electric starting with the exclusive International Diesel starting system, variable speed governing that automatically increases engine torque under load, and International's own advanced design combustion and fuel system which secures maximum work for the fuel consumed, are representative of the many money-making features of International Diesels. Find out how International Diesels can serve you. They are available in sizes from 39 to 180 horsepower — ready to run! Consult your International Industrial Power Distributor or write direct for information.

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INTERNATIONAL *Industrial* **POWER**
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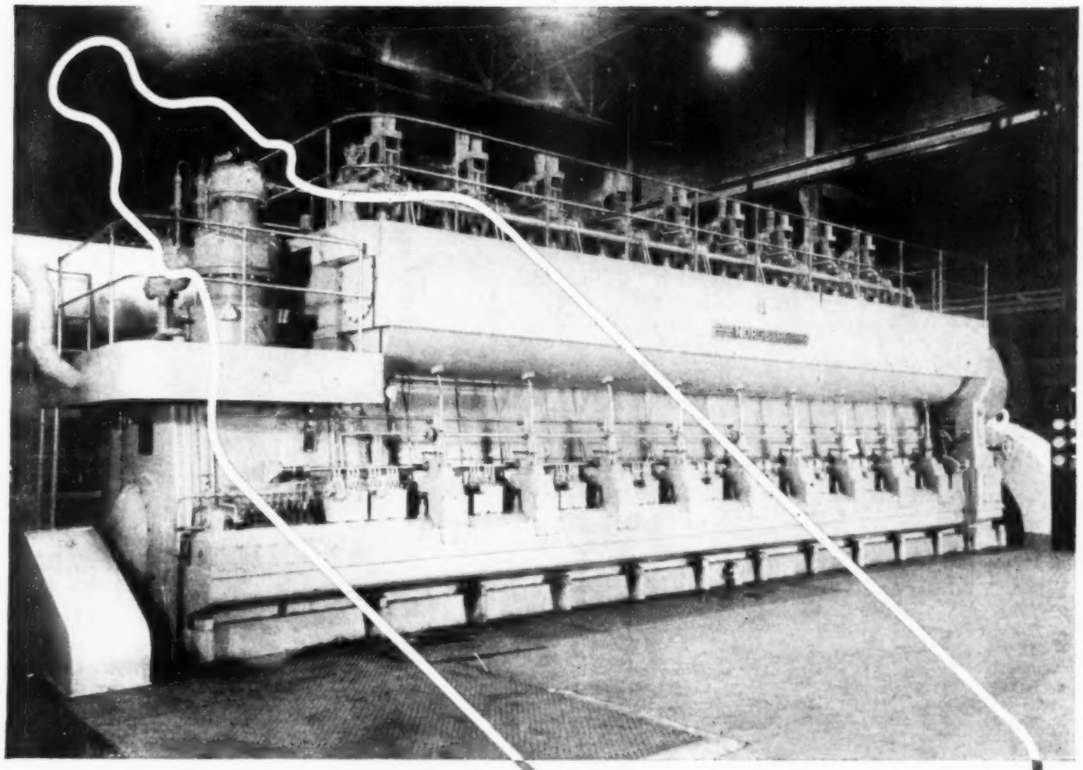

FEEDING PROBLEMS...
by Bottle or Barrel

REGARDLESS of size, your plant equipment is an important investment. It's an investment that deserves special "care and feeding." For example, it's not unusual for operators of the "big babies" like this mammoth diesel above to put them on special "formula" diets for protection. When this happens, the services of a seasoned lubrication engineer are helpful.

Cities Service lubrication engineers are thoroughly grounded in up-to-the-minute lubrication techniques on diesel engines.

They know what proper types and grades of oils, greases and fuels will best meet your individual requirements.

At absolutely no obligation to you, a Cities Service lubrication engineer will make a thorough, on-the-spot analysis of your lubrication requirements. His recommendations may substantially reduce your operation and maintenance costs. Write Cities Service Oil Company, Room 157, Sixty Wall Tower, New York 5, N. Y.

We have a new 66 page booklet entitled "Diesel Engine Lubrication." This complete lubrication manual is yours for the asking.

CITIES SERVICE

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New Haven Railroad Annual Report Stresses Diesel Economy

SOME quotes from the annual report of the New York, New Haven and Hartford Railroad Co. point out the value of diesel operation on railroads:

"The New Haven saved $1,400,000 annually from dieselization of the Maybrook-Worcester freight route and $600,000 annually from replacement of steam locomotives with 35 diesel-electrics will be saved when diesel electric deliveries are completed."

"Already one of the largest diesel-owning railroads in the country, the New Haven will have 250 units of diesel-electric power when the full order is completed. Our new equipment includes: 15 triple-unit 4500 hp. diesel electric locomotives, 35 diesel-electric switching locomotives (25 of which have been delivered), for replacement of steam power, and in addition, 27 new 2,000 hp. diesel-electric locomotives for main line service are to be purchased, with a further annual saving of $1,000,000."

Alco Sounds Steam's Requiem

ON June 16th The American Locomotive Company suspended production on steam locomotives. The last steam locomotive, a 2-8-4 freighter, left the plant making way for all-diesel production for the first time in nearly 100 years.

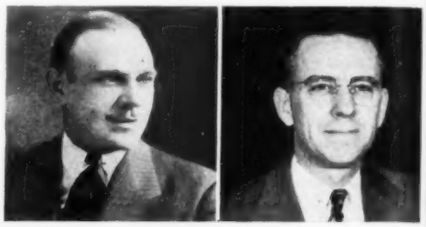
P. T. Egbert, vice president in charge of the locomotive division explained the company's action. "American Locomotive is not intentionally going out of the steam locomotive business. It is simply a matter of demand. All orders and inquiries for new motive power from domestic railroads are for diesel-electrics.

"We have been preparing for this day for a number of years and have invested more than $20,000,000 to convert our facilities from steam production to diesel-electrics. It is estimated that our diesel-electric production this year will be 150 per cent of that for 1947.

Alco also announced that the first road locomotive to be built for export was under construction in the Schenectady plant. It is a 1500 hp. freight diesel electric, for the Central Railway of Brazil.

Cummins Names New Vice Presidents

DIRECTORS of Cummins Engine Company, Inc., have named three new vice presidents and one new director for the ensuing year. J. I. Miller, President of the company, announced the board action after its organization meeting held at the corporation offices in Columbus, Indiana, following the annual shareholders meeting on Tuesday, April 6th.



D. J. Cummins L. W. Beck

The newly elected vice presidents are: L. W. Beck, Vice President—Sales; D. J. Cummins, Vice President—Engineering, and W. M. Harrison, Vice President and Treasurer.

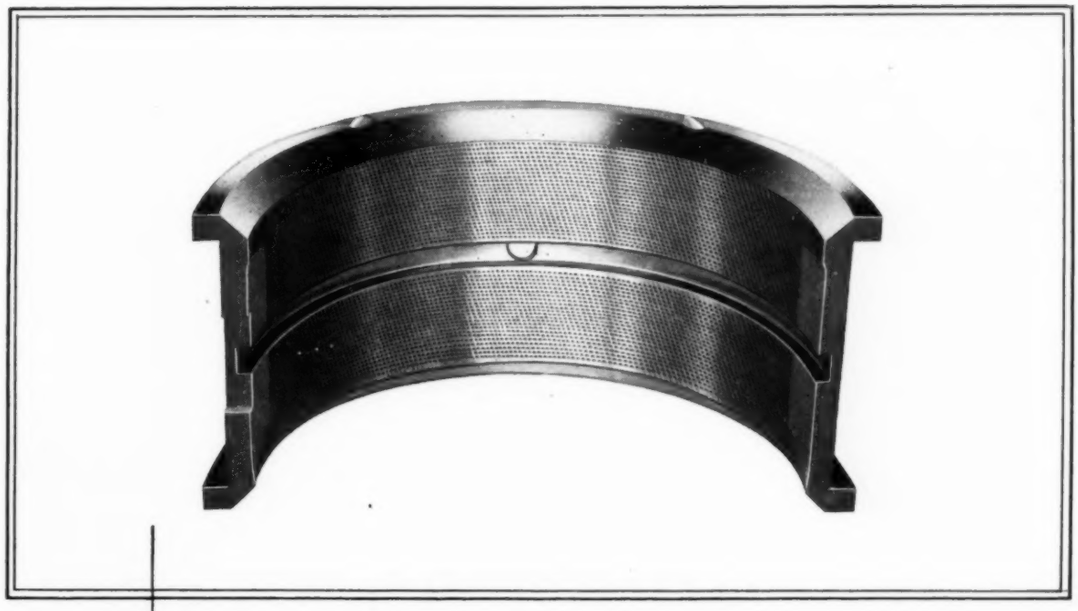
W. M. Harrison C. R. Fox

Carl R. Fox, in addition to holding the position of Vice President and Works Manager for several years, is the newly elected director.

All other officers were re-elected as follows: C. L. Cummins, Chairman of the Board; J. I. Miller, President; V. E. McMullen, Executive Vice President; R. E. Huthsteiner, Vice President and General Manager; Carl R. Fox, Vice President and Works Manager, and E. G. Crouch, Secretary.

A.R.B.A. Road Show To Be Held July 16th To 24th

SOLDIERS Field in Chicago will be host this month to the largest gathering of road building equipment and related machinery ever assembled in one place. Under the sponsorship of the American Road Builders Association, the 8-day program includes talks on the various aspects of highway and airport construction as well as more specialized problems such as state and municipal road maintenance. Diesel driven equipment will be featured in the exhibits.

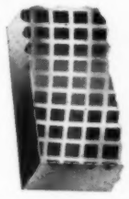


Centrifugally cast—for greater fatigue strength

The N-B-M Gridded Bearing is a one-piece casting of homogeneous Lead-Bronze—a casting which assures better heat distribution, greater resistance to fatigue, longer and more economical bearing life.

In conventional bearings, dissimilar shell and lining metals often cause internal stresses because of differences in coefficient of expansion. N-B-M Gridded Bearings are centrifugally cast—this strong, unit construction process attains greater fatigue strength. There is no separate shell with a different expansion coefficient to cause the building up of internal stresses. Developed by thorough American Brake Shoe research, N-B-M Gridded Bearings have been service-proved by many installations in heavy duty, high speed diesel engine service.

The N-B-M one-piece, Lead-Bronze construction also improves heat distribution, guards against excessive build-up of heat in local areas of the bearing. Problems of bonding are eliminated. Note these other outstanding advantages of N-B-M centrifugally-cast Gridded Bearings:



Enlarged Section of N-B-M Gridded Bearing

Precision-Spaced grids, filled with silver babbitt, trap dirt particles. During sudden periods of overstress, some of the babbitt melts and flows to the affected area to protect the shaft against damage.

- **Greater wall-to-wall structural strength**
- **Lead-Tin overlay for added corrosion resistance and conformability**

National Bearing Division has perfected unique casting methods which permit mass-production savings on Gridded Bearings without sacrificing quality or accuracy. For long range economy, better engine performance and greater dependability, use N-B-M Gridded Bearings in your diesels.

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Osborn Receives Honorary Degree

THE railway supply industry is recognized in the announcement of candidates for honorary degrees to be awarded at the June 4 commencement of the University of Cincinnati.

Dr. Raymond Walters, University of Cincinnati president, disclosed that C. R. Osborn, vice president of General Motors and general manager of its Electro-Motive Division at La Grange, Ill., will receive the honorary degree of Doctor of Science

Mr. Osborn, who has headed General Motors locomotive building activities since 1943, was a mechanical engineering graduate of the University of Cincinnati in 1921.

Engineering Societies Meetings Scheduled

S.A.E. National Meetings

National West Coast Meeting	St. Francis Hotel	San Francisco, Cal.	August 18-20
National Tractor and Diesel Engine Meeting	Hotel Schroeder	Milwaukee, Wisconsin	Sept. 7-9
1949 Annual Meeting	Hotel Book-Cadillac	Detroit, Michigan	Jan. 10-14, 1949

Livingston Named Sheppard Vice President

FRED D. LIVINGSTON, former general sa manager has been promoted to the position vice president of the R. H. Sheppard Compan manufacturers of diesel engines.

G. E. Building First Gas Turbine For Electric Utility

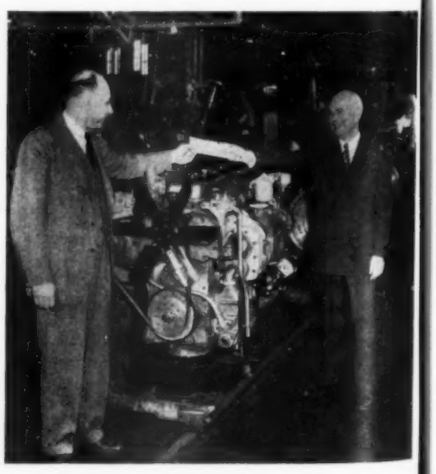
THE first gas turbine for an electric utility this country is under construction at the Gener Electric Company's Schenectady Works and w be shipped to the Southwest early in 1949, J. Belanger, manager of G.E.'s Turbine Division announced recently.

A duplicate of the 4800 hp. locomotive gas tu bine first publicly announced in March and no undergoing tests, the 3500 kw. turbine generat set was purchased by the Oklahoma Gas and Ele tric Company. It will be installed at the Arthu S. Huey station, Oklahoma City.

The new gas-fired unit will be installed in a extension to the present station and operated o natural gas which is available in abundance i the area. The waste heat from the exhaust wi be used with a separate heat exchanger to supple ment the present boiler feed water heating system This will result in additional kilowatt output fro the station by releasing part of the heating loa from the present installed equipment.

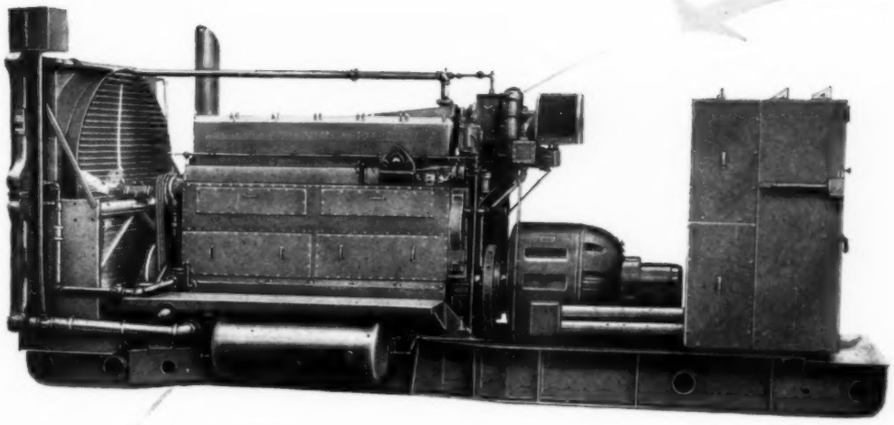
40 Million Horsepower

AN important milestone in the production and use of diesel engines was reached recently when the manufacture of the 250,000th General Motors Series 71 2-cycle diesel engine was announced by W. T. Crowe, General Manager of the Detroit Diesel Engine Division.

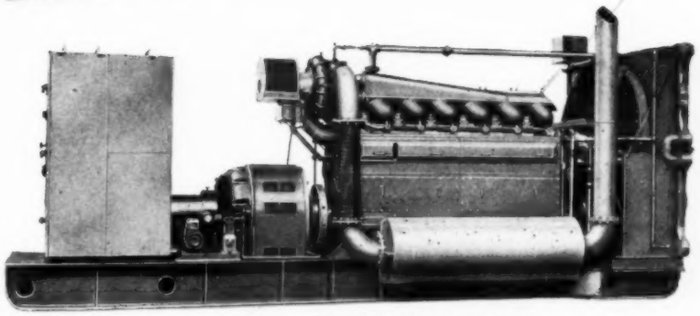


G. A. Zinc delivers 250,000th diesel to V. C. Gann

The quarter of a million engines produced by this one factory represent an impressive total of over 40,000,000 horsepower; four times the total diesel horsepower that was in existence in January 1938 when the Division first started operations. Starting with only 460 employees 10 years ago, Detroit Diesel has steadily grown to an organization of several thousand highly trained men and women. In that time nearly 1,000,000 sq. ft. of floor space has been added to the plant's original working area of 132,000 sq. ft.



NEWEST of the CP Diesel-Electric Package Units



REAR VIEW OF 500 KW UNIT

EFFICIENCY PLUS ECONOMY

LOW FUEL CONSUMPTION results from efficient design of combustion chamber, valve mechanism and fuel injection system.

INSTANTANEOUS STARTING is assured by simple starting valve which admits air through distributor. The distributor, in turn, admits air at timed intervals to each cylinder.

DUST-TIGHT COVERS completely enclose all wearing parts, but are easily removed for inspection.

LUBRICATION is completeley automatic force feed, resulting in exceptionally low maintenance.

EVERY PART is designed with ample strength for maximum rigidity with minimum weight, assuring long service life.

An outstanding product of Chicago Pneumatic's 34 years' experience in engine building, this 500 kw CP Turbo-charged Diesel Engine Generator Set* is designed for continuous, medium-speed, heavy-duty service.

Furnished complete with piping, wiring, and all accessories, ready for immediate installation . . . it can be set up quickly and easily...in minimum space...with minimum installation expense.

Write for complete information.

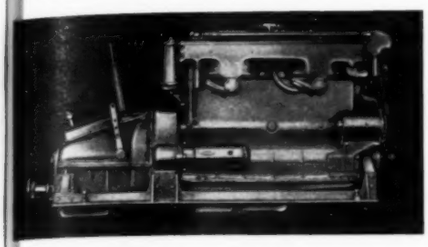
*BUILT UNDER ELLIOTT-BUCHI LICENSE

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

AIR COMPRESSORS • ELECTRIC TOOLS • PNEUMATIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Graymarine Diesels in Test Boat



150 H.P. Gray Marine diesel.

THE former GM-3, now renamed *The Grayling*, a 53 ft. Express Cruiser with 16 ft. of beam, which Gray Marine Motor Company turned over to the U. S. Navy at the start of the war, has been repurchased. The vessel has now been repowered with two of Gray's new six-cylinder diesels, piston displacement 572 cubic inches, rated 150 hp. at 2000 rpm. Under command of Capt. James Henderson, demonstrations are being arranged at Charleston, Norfolk, Baltimore, Philadelphia, Washington, New York City, and Buffalo, with final destination Detroit.

Floating Derrick *Hercules*

A broadside view of the floating derrick *Hercules* being towed to Todd Shipyard, Brooklyn by the *Thomas E. Moran*. She is powered by a Busch-Sulzer diesel and can lift 230 tons

The Feminine Touch

"QUEEN" Pat Walker wields the oil can on a rocker arm of one of the Enterprise diesels in the California State Polytechnic College power house. Miss Walker was "borrowed" from the students of Chico State College to reign as queen of the 16th annual Poly Royal held at the college.

Names in the News

GRANT H. NABLO, one of the foremost figures in the marine engine field, was recently elected to the Board of Directors of the Gray Marine Motor Company, of Detroit, according to an announcement by John W. Mulford, president of Gray. For many years Sales Manager of the company, Mr. Nablo has divided his time between Miami and Detroit since the end of the war in order to keep in close touch with various phases of marine engine development.

FRED W. ROTH, 15-year veteran of the industrial storage battery industry, has just been elevated to the post of Vice President in Charge of Trenton Plant Operations for the Gould Storage Battery Corporation.

Mr. Roth is a graduate of the Wharton School, University of Pennsylvania and attended Central High School in his native city of Philadelphia. While at the University he won his letter in varsity crew for two years and was elected to the national honor societies Pi Gamma Mu and Beta Gamma Sigma. Mr. Roth is a member of the Carteret Club and the Chamber of Commerce in Trenton and of the Little Egg Harbor Yacht Club. He is married and is at present living in Philadelphia.

APPOINTMENT OF ALBERT B. WILLI, Jr., as chief engineer in charge of sales engineering was announced recently by H. F. Dixon, chief engineer, Federal-Mogul Corporation of Detroit, Michigan.

FRANKLIN F. BOGARDUS, district sales manager for Roots-Connersville Blower Corp., Connersville, Ind., has opened an office in Cleveland, Ohio, at 2306 East 22nd St., in the Plymouth Building, and will cover about the same territory previously handled from the factory.

APPOINTMENT OF John Walker as manager of Off-Highway and Mining Truck Sales was announced recently by A. C. Fetzer, vice-president of Mack Trucks, Inc.

RAY L. NEWTON, JR., has been appointed Assistant to the General Sales Manager of the Detroit Diesel Engine Division. The appointment was announced recently by V. C. Genn, General Sales Manager. Newton's association with the Detroit Diesel Engine Division dates from October 1941. Starting as a clerk in the Master Mechanic's Office he became Assistant to the Chief Inspector in 1944 and served in that capacity until his present promotion.

R. L. Newton

THREE NEW REGIONAL FIELD representatives have just been appointed by Burgess-Manning Company to aid Burgess Snubber users in their respective territories.

Two companies, the H. G. McLaughlin Company, Inc., and The Merrill Company, were associated with Burgess-Manning before the war. The H. G. McLaughlin Company is located in Seattle, Washington. The Merrill Company will handle sales for Burgess-Manning in the San Francisco territory, The Rucker Company, Oakland, California, represents Burgess-Manning in the Los Angeles area.

THE GEO. D. ROPER CORPORATION announced recently the appointment of Frederick R. Dickerson as Sales Manager of the Pump Division. He has been with Geo. D. Roper Corporation since 1936 when he joined the engineering department and later was transferred to the pump sales department. In his new position as Sales Manager, Mr. Dickerson will head the sales department at the home office in Rockford and will be chiefly concerned with sales control and market analysis.

F. R. Dickerson

FRANK B. POWERS has been elected Assistant Vice President, Engineering, of The Baldwin Locomotive Works. Mr. Powers graduated from the University of Illinois in 1926 and is a well known figure in the field of transportation. Mr. Powers joined The Baldwin organization in January, 1947 as Assistant to Vice President-Operations and in July of that year he was given complete responsibility for all engineering activities of the Eddystone Division.

F. B. Powers

HERBERT H. ROOSA, for the past two years sales manager of Manzel, Inc., was recently elected vice-president in charge of sales at a meeting of the board of directors of the company, it was announced by Ralph F. Peo, president.

Under Mr. Roosa's direction during the past year, the company's sales volume has multiplied four-fold, partially as a result of its expansion into the automotive field. The company's manufacturing space has been doubled through the erection of a building on property adjoining its older plant.

M. L. NOEL, Vice President and General Sales Manager of the Allis-Chalmers Tractor Division, has announced the appointment of E. G. Kullmann as Assistant General Sales Manager. On his new assignment Kullmann will undertake for the entire Tractor Division duties similar to those he has been handling as Assistant Industrial Sales Manager since 1939.

CATERPILLAR TRACTOR CO. announced recently that B. J. Grimm and J. F. Heschong Jr. have been named Eastern Division Parts Manager and Assistant Parts Manager respectively.

Grimm succeeds E. W. Ryder, Eastern Parts Manager since June 1947, who resigned his position to become General Parts and Service Manager for Cleveland Brothers Equipment Co., Inc.

CATERPILLAR TRACTOR CO. has recently announced the appointment of several new parts depot managers and assistant managers, according to M. T. Deames, Caterpillar General Parts Manager. John Davis remains as manager of the new depot at Atlanta, Georgia, Wilbur Legg moves from the main offices in Peoria, Illinois, replacing Ira Taylor who leaves to manage the new parts depot soon to be opened at Shreveport, Louisiana. Roscoe Booker has been transferred to the Minneapolis depot as manager. Bill Oedewaldt leaves the Peoria parts office to become assistant manager under Booker. The new Minneapolis parts depot is expected to be opened this spring. Howard Burgener has been promoted to manager of the Kansas City depot.

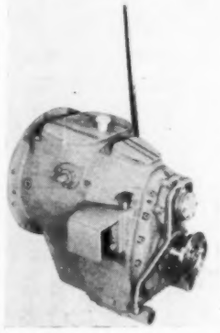
A Friendly Reminder

If your copy of the May Historical issue of DIESEL PROGRESS "Walked Off"—as many have—or if you want an extra copy—order it today. Supply of this big issue is dwindling daily and will soon be gone—price $5 per copy. —Send your order to Diesel Progress, 2 W. 45th St., New York 19, N. Y.

A LONG-STANDING NEED of power utilities and industry using power for a compact, easily moved, short-notice source of emergency electric current may be filled within the next few years by mobile gas turbine plants now under development by Allis-Chalmers engineers. Studies have already been made of 3000 and 6000 kw. units to be mounted on railway trucks for rapid movement over normal railway track. The proposed units could operate as a sole source of power or could be synchronized with an existing power system.

The prime mover of the 3000 kw. unit operates on the simple gas turbine cycle with regenerator. With an inlet temperature of 1300 F., the unit would have a fuel-bus efficiency of about 23 per cent at full load. Mounted on eight carrying axles arranged in four standard freight car trucks, the power plant would weigh approximately 230,000 pounds. Sufficient oil-tank space is built into the unit to permit full load operation for at least six hours.

AN IMPROVED STREAMLINED reverse and reduction gear known as the 1948 Model "YC" is being manufactured by the Auto Engine Works. This unit is very popular on fishing boats and cruisers and other boats using diesel or gasoline engines from 150 hp. at 1500 rpm. to 300 hp. at 2100 rpm.



Model "YC" reverse and reduction

With multiple disc clutch, bever gear reverse, helical spur reduction gears, the operation is smooth and quiet. Lubrication is independent of the engine assuring proper oiling at all times.

The 1948 Model "YC" is available in ratios 1½ to 1, 2 to 1, 2½ to 1, and 3 to 1. Further details may be obtained by writing Auto Engine Works, St. Paul, Minnesota.

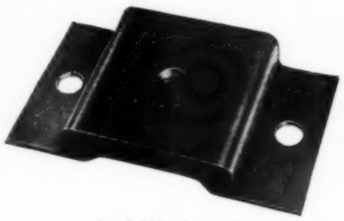
THE SOCONY-VACUUM Oil Co., Inc., announced recently that practically all phases of a general expansion, improvement and rehabilitation program are now under way at its refinery at Casper, Wyoming. This refinery handles two types of crude oil from producing fields in Wyoming. Its products include gasoline, kerosene, distillate heating fuels, tractor and diesel fuels, and asphalt.

One effect of the program, which will double the refinery's current 3,000-barrel-per-day capacity, will be to convert the refinery into "one of the most modern and most efficient in the United States," according to Socony-Vacuum. Another effect will be increased supplies of products of superior quality for the area which the refinery serves.

The Catalytic Construction Company of Philadelphia, Pa., is the general contractor for the project, handling mechanical design and field con-

struction under the supervision of Emory M. Skinner, chief refinery engineer of Socony-Vacuum's White Eagle Division.

THE "SHOCKMOUNT," recently announced by the Lord Manufacturing Company of Erie, Pa., is designed to control shock, isolate high frequency vibration, and reduce noise transmittance to the floor. It is a heavy duty mounting, with load



Lord "Shockmount"

capacities up to 7500 lbs. per mount. It also features low, compact construction (1-3/16 in. high), easy installation and rugged 3/16 in. steel construction. The flexing element is oil-resistant synthetic rubber. For further information write to Lord Mfg. Co., Erie, Pa., for a copy of Bulletin 400.

METALOCK REPAIR SERVICE, INC., has just published a new bulletin describing and illustrating the repair of cracked and broken castings by its unique cold working process. The bulletin shows the repair of diesel engine bases, crankshafts, pistons, liners, and cylinder heads by this method. The bulletin also lists the Metalock agencies located throughout the country. Copies are available by writing for Bulletin No. 104, Metalock Repair Service, Inc., 36-15 48th Ave., Long Island City 1, New York.

THE MICRODRILL is a unique, precision instrument for rapidly drilling accurate small holes. By means of a thermal motor feed and automatic electronic control circuits, the surface of the work to be drilled can be quickly and precisely located and the depth of the hole held to close tolerance. Both the danger of breaking even the smallest drill and visual observation of the drilling operation have been virtually eliminated.

Teletronic microdrill

Vertical movement of the drill is accomplished by electronically controlling the amount of electric power fed into a spring-loaded thermal unit. As the power is increased, the temperature of the unit rises and it elongates, allowing a powerful spring to lower the spindle. The action is extremely smooth and can be precisely controlled.

The standard model has a collet for .004" to .025" pivot drills and a maximum recommended electronic feed travel of .150". A variable electric drive provides a maximum spindle speed of approximately 50,000 rpm.

"CLEAN OIL," a quarterly publication of Honan-Crane Corporation, presents an interesting case history of oil purification and how it solved several major problems for a Canadian plant. This case history tells how Honan-Crane Purifiers, installed on 43 engines, have extended engine overhaul periods from 5,000 to 10,000 or more hours, cutting the labor bill and downtime for engines in half. Parts replacement costs also have been greatly reduced. The total purification cost figures about $1 per week per engine.

Copies of "Clean Oil" are available on request to Honan-Crane Corporation, 202 Indianapolis Ave., Lebanon, Indiana.

A NEW CHEMICAL MATERIAL possessing the dual ability to clean and deodorize in a single, simultaneous operation has recently been announced by Oakite Products, Inc. This new material, known as Oakite Di-Sanite, is a fine, free-flowing powder, mildly alkaline, that is readily soluble in hot or cold water, and which is said to possess pronounced wetting, penetrating and detergent ability, as well as deodorizing action. Material is safe to use, free from abrasives and harmful ingredients and its solutions may easily be applied on surfaces by simple sponging, wiping or mopping, the manufacturer states. Readers desiring additional data should address Oakite Products, Inc., 122D Thames Street, New York 6, N. Y.

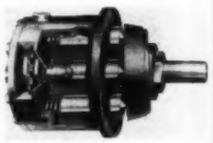
A NEW EIGHT-PAGE Bulletin No. 28 entitled "7 Questions and Answers About Meehanite Castings" has just been prepared by the Meehanite Metal Corporation. The booklet by the means of answering seven fundamental questions explains in a concise manner just exactly what Meehanite metal is and the basic characteristics which it makes available to industrial users of iron castings. A copy will be sent free upon request to Meehanite Metal Corporation, Pershing Square Building, New Rochelle, N. Y.

WILKENING MANUFACTURING CO. has developed a new chrome-faced piston ring which is claimed to have a life expectancy two to four times that of conventional rings. This Pedrick ring has three years of development and testing in back of it. A special alloy, centrifugally cast, then heat treated to produce a dense, uniform structure, is used. It has been found that the new alloy is more satisfactory than ordinary piston ring material in that it does not become subject to hydrogen embrittlement when it is chrome plated.

TITEFLEX MONEL metal flexible tubing is described in a new folder just published by Titeflex, Inc., 524 Frelinghuysen Ave., Newark 5, New Jersey. Included are complete descriptions of the physical properties and corrosion resisting characteristics of the tubing.

THE ANNUAL MEETING of the Executive Committee of the National Association of Engine and Boat Manufacturers was held recently in New York City. Among those present were George W. Codrington, of the Cleveland Diesel Engine Division, General Motors Corporation; John W. Mulford, of Gray Marine Motor Company, Inc.; Henry R. Sutphen, of the Elco Yacht Division, Electric Boat Company, New York City; John Trumpy, Jr., of John Trumpy & Sons, Inc.; Wesley L. Wheeler, of the Wheeler Shipyard Company; William G. Wood, of the Consolidated Shipbuilding Corporation, and Ira Hand, Secretary of the Association.

A NEW DEVELOPMENT in hydraulic pumps is found in the Dudley "nutating plate" piston type unit equipped with rotary valve action. Simplicity of design eliminates many of the parts conventionally used in hydraulic pumps. The only revolving part is the driveshaft. The Dudley pump operates in either direction with one adjustment. The rotary valve is full floating and is hydraulically balanced. A new bulletin describing this pump may be secured by writing Eastman Pacific Company, 2320 E. 8th St., Los Angeles 21, California.



Dudley pump

THE BALDWIN LOCOMOTIVE works announced recently receipt of an order from the Reading Company for fifteen (15) 1000-hp. diesel-electric switching locomotives. Delivery of the locomotives is scheduled for early fall. The Reading Company has been using Baldwin diesel-electric switchers since 1939 and now has a total of forty-seven (47) in service.

THE 1948 TRUCK & TRAILER Size & Weight Restrictions Booklet which includes the most up-to-date listing of laws affecting size and weight restrictions for commercial vehicles is ready for distribution by The Four Wheel Drive Auto Company. Copies of this booklet may be had by writing to The Four Wheel Drive Auto Company, Clintonville, Wisconsin.

STUDENT CAPACITY, space, and equipment facilities at the Brown School of Instrumentation in Philadelphia has been doubled through the leasing of new and larger quarters consisting of a four-story building. The school now in its 14th year, is conducted for training both customer and Brown Instrument Company service and maintenance engineers.

A Friendly Reminder

If your copy of the May Historical issue of DIESEL PROGRESS "Walked Off"—as many have—or if you want an extra copy—order it today. Supply of this big issue is dwindling daily and will soon be gone—price $5 per copy. —Send your order to Diesel Progress, 2 W. 45th St., New York 19, N. Y.

MACHINING AND REPAIRING DIESEL ENGINES, a bulletin, compiles case histories of the production of diesel engine components by the use of horizontal boring, drilling and milling machines.

Prepared as a supplement to the G&L Handbook, *Horizontal Boring, Drilling and Milling Machines and Their Application,* this bulletin will be distributed to all Handbook owners, and will be mailed on request to other interested persons by the Giddings and Lewis Machine Tool Company, Fond du Lac, Wisconsin, U.S.A.

COLUMBIA ELECTRIC Manufacturing Co. has published a new catalog bulletin on Columbia A.C. generators. It describes these generators which are manufactured in sizes from 6¼ through 375 kva. with speeds up to 1800 rpm. They are offered in standard voltages for belted or coupled service. Models with direct connected or top mounted exciters are available. Write Columbia Electric Mfg. Co., 4519 Hamilton Ave. N.E., Cleveland 14, Ohio for your copy of this bulletin.

"THE DEPENDABLE DIESEL" enters its fourth year of publication with a new 24-page issue just off the press. Published by the Cummins Engine Company, Inc., the current issue of this magazine for power users contains more than 40 pictures showing Cummins Diesels used in a wide range of applications. Copies of the magazine may be obtained from any Cummins Dealer or by writing directly to the Cummins Engine Company, Inc., Columbus, Indiana.

INTERNATIONAL HARVESTER recently received an award of merit for the materials handling installation in its new Baltimore parts depot. The award, first of its kind, was made by Modern Materials Handling, magazine for the materials handling industry.

The materials handling installation at Harvester's Baltimore parts depot was designed to make maximum use of mechanical materials handling equipment with benefits to employes in the way of clean, orderly, safe, and easier working conditions; with the obvious benefits of speedy and economical movement and storage of material and parts.

A FIVE-DAY TRAINING CONFERENCE in Industrial Experimentation will be offered by the Engineering School of Columbia University, New York, September 14-18, 1948. The course is intended to provide both formal and practical insight into fundamentally effective techniques for persons with a background of experience and at least one course in statistics, quality control, or the equivalent.

Arrangements have been made for dining as a group at the Men's Faculty Club. Provision has also been made for inexpensive lodging on campus. The fee for the Conference, including all books and supplies and all lunches and dinners at the Men's Faculty Club is $100.00. Further inquiries and requests for brochure and application may be addressed to Professor S. B. Littauer, Department of Industrial Engineering, Columbia University, New York City 27.

WORLD-WIDE SALES rights for two graphitized super lubricants known as "Miracle Power" and "dgf-123" have been recently acquired by The AP Parts Corporation, Toledo, Ohio, from the Miracle Lubricating Corporation of Detroit.

Miracle Power is used in motor oils and fuels, while dgf-123 provides a dry graphite pre-lubricant for application to engine parts before assembly. In Miracle Power, synthetic colloidal graphite is suspended in a fine grade of pure, light petroleum oil. dgf-123, manufactured under U. S. Patent No. 2-426-983, is a concentrated dispersion of colloidal graphite in alcohol and carbon tetrachloride. When used as directed, either of the two super lubricants gives all metal surfaces a thin graphoid film.

THE KORFUND COMPANY, national distributor for Armstrong Vibracork, has published a four-page bulletin describing the use of Standard and Heavy Density Vibracork for economical vibration control.

Featured are more than a dozen drawings of application methods developed to isolate machines effectively under different installation conditions. Complete Vibracork specifications are included. Write Korfund Company, 48-29 Thirty-second Place, Long Island City 1, N. Y.

A NEW COMPLETE CATALOG issued by the Flodar Corporation, describes in detail the important role of Tube Fittings in the sealing of higher fluid pressures.

The booklet introduces in layman's language the engineering and design problems in the basic problem of sealing high fluid pressures. Complete, detailed engineering specifications are clearly and accurately presented for both the Flodar Fluid Metress no flare fitting and the Grip Tube flare type fitting.

Copies of this catalog are available upon request to Flodar Corp., 331 Frankfort Ave., Cleveland, Ohio.

THE PURCHASE OF the Atlas Imperial Diesel Engine Company plant and facilities at Mattoon, Illinois, was announced recently by F. M. Young, President of Young Radiator Company. Mr. Young stated that plans are now being made to build additional facilities at Mattoon to accommodate increased production and expansion of their line of large "VAD" vertical air discharge cooling and condensing units, jacket water coolers and other products. The company will hire locally for their labor requirements.

New Books

AN INTERESTING STUDY *Supercharging the Internal Combustion Engine,* by E. T. Vincent, presents the essential fundamental theory of the various forms of superchargers and turbo superchargers in use today, together with effects on engine cycles, power outputs, and thermal efficiencies. A forty page section is devoted to a description of diesel supercharging. McGraw-Hill Book Company is the publisher.

PRACTICAL FOR SHORT COURSES in thermodynamics is V. M. Faires' *Elementary Thermodynamics,* published by Macmillan Company. Mr. Faires, Professor of Mechanical Engineering at Texas A. & M., has included a wide range of material in this book, which is clearly and simply presented.

A BOOK THAT SHOULD be valuable to production men is *Quality Control Methods* by Clifford W. Kennedy, published by Prentice-Hall, Inc. Kennedy has succeeded in presenting the subject of quality control without utilizing the complicated procedure of the statistician. This book amply fills the gap between the expert and the beginner and enables the understanding of the basic details and primary concepts of this method of controlling the quality of output of a lathe, press or milling machine, or for that matter any production run product.

West Coast Diesel News

By FRED M. BURT

POWERED WITH an 830-hp. Enterprise diesel engine is the 103-ft. *Pan Pacific,* newest addition to San Pedro's fleet of tuna purse seiners; built by Pacific Boat Bldg. Co., Tacoma; Andrew Kullis, skipper, part-owner, fishing for Pan Pacific Fisheries Co., Terminal Island, Calif.

BUILT FOR the account of Evans Engine & Equipment Co., who supplied the 2-cylinder 2-cycle, 55-hp. General Motors diesel propulsion engine, the 34-ft. diesel troller *Show Girl,* designed by Edwin Monk and built by the Sagstad Shipyards, Seattle, is a model of modernity as to equipment and gear.

THE ST. BERNADETTE, combination seiner and dragger, delivered to Rudy Franulovich by Kazulin and Cole, Tacoma, is powered with a 135-hp. Atlas diesel with a 2:1 Twin Disc reduction gear.

AN 82-FT. PURSE SEINER built by Al Larson's Boat Shop for Tony diLeva of San Pedro, is powered with a 330-hp. Washington diesel engine.

PURCHASED FROM the San Diego branch of

Shepherd Diesel Marine, August Silva has installed a 75-kw. "Caterpillar" diesel generating set in his fishing boat *Columbus.*

THE 40-FT. *Service X,* latest addition to tugboat fleet of A. Escott Co., Vancouver, B. C., recently launched at Vancouver Shipyards, Coal Harbor, is being powered with a 70-hp., heavy duty, Atlas diesel.

ANNOUNCED BY Charles G. Cox, Pacific Coast Manager for Nordberg, H. G. McKinney & Co., Wilmington, Calif. has been appointed distributor for Nordberg marine engines, diesel and gas. They will offer ready service from Morro Bay to the Mexican Border.

SKIPPER BILL WAGNER'S 35-ft. *Albacore* and combination boat out of Los Angeles Harbor has just been repowered with 50-hp. 4-cyl. Cummins diesel supplied by Terry Siler.

LAUNCHED AT the Pioneer Mfg. Co. yard, Lake Union, Seattle, with a Foss floating crane, the H. M. Parks Co.'s 75-ft. *Robbie* has propulsion by a 500-hp. General Motors diesel through 2:1 reduction; winches, pumps, etc. run by electricity from G-M generating plant. She will serve Western Fisheries Co., Cordova, as a cannery tender during the salmon season, fish halibut in the spring and Albacore in fall and winter.

D. C. & C. W. PARKS have installed a new 300-hp. Superior Gas engine to power a deep well pump used for irrigation purposes on their large ranch near Bakersfield, raising principally potatoes and cotton; a similar unit has been installed for the same purpose by the Tejon Potato Co., Arvin, Calif.

TO DRIVE A deep well, turbine, irrigating pump through a right angle gear head, a Model 3400, 25-hp. "Caterpillar" diesel engine has been installed by Robert Brandt on his ranch in the Owens Valley, raising alfalfa principally.

THE NEW 180-FT. welded, all-steel ferry boat *M. R. Chessman* for the Columbia River, between Astoria, Ore. and Megler, Wash., launched at the yard of Albina Engine and Machine Works, Portland, is powered with a 6-cyl. 16 x 20½, 800-hp. Union diesel engine; two 25-kw. diesel generating units for auxiliaries.

LAUNCHED AT National Iron Works, San Diego, designed by G. Bruce Newby, 510-ton *Velero IV*, powered with a 600-hp. Atlas diesel marine engine, with two 75-hp. and two 25-hp. diesel auxiliaries; is a specially built 110-ft. steel U. S. Marine Laboratory ship, for marine biological, botanical and geological research.

A 36-FT. COMBINATION boat for Carmelo Patania and Son, under construction by Genoa Boat Works, San Francisco, will be powered with a 3-cyl. 85-hp. General Motors diesel supplied by West Coast Engine & Equipment Co., Oakland.

SUPPLIED THROUGH National Supply Co. factory branch at Los Angeles, there have been 14 recent installations of 6-cyl. 300-hp. Superior Gas engines to drive deep well turbine pumps for irrigation purposes in various locations in Arizona.

ADVERTISERS' INDEX